POPULAR MECHANICS

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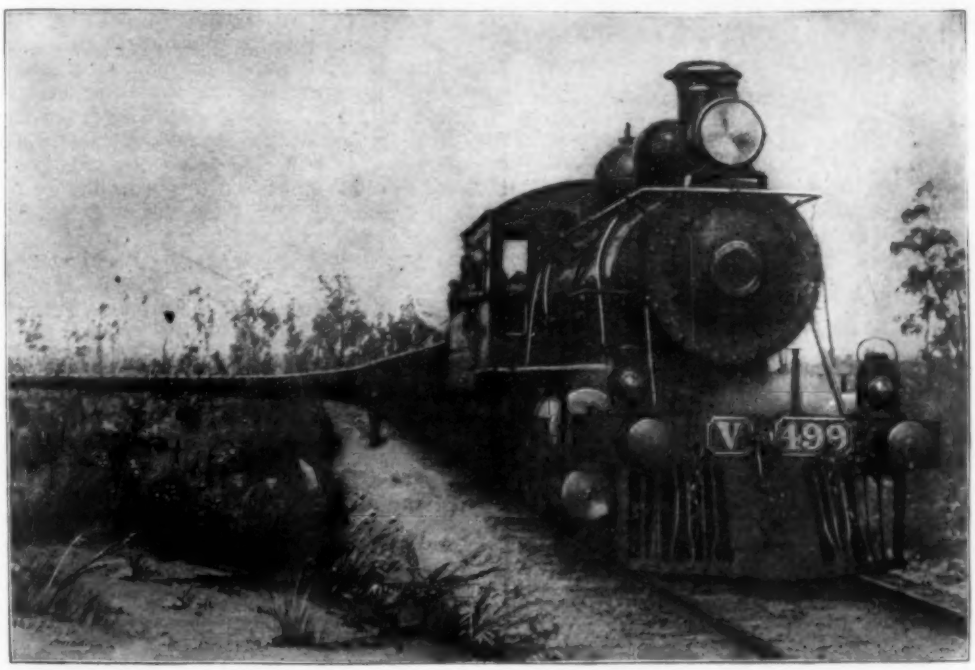
Victoria's Longest Train

Consolidation Type Hauls 54 Cars Weighing 781 Tons Over Heavy Grades



Government Railways of Victoria—Test Train

Fifty-four cars including a caboose, composed a test train hauled over the Government Railways of Victoria recently, between Nyora and Melbourne. The train, exclusive of engine and tender, weighed 781 tons and is the heaviest train ever hauled in the colony of Victoria.

The train was pulled by a consolidation locomotive of the Vauclain compound system. The ruling gradient on the line was one in 75 or a raise of 70 feet per mile. So successful was the test that all the Government Railways are to be equipped with this type of American-built locomotives in the future.

American-built engines are found at the remotest corners of the globe, and it would be hard to convince the average American that any locomotive of foreign construction could surpass some of those put out by our renowned companies. In several recent constructions, however, foreign types have been adapted to American practice without departing from the symmetry and pleasing arrangement obtaining in American types.

BABY AUTO FOR INFANTS.

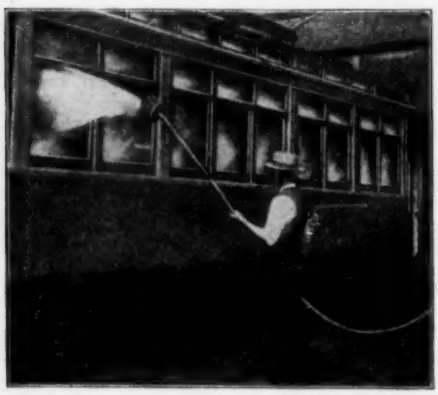
An automobile only 4½ feet long and 1½ feet wide was a prize winner at a recent contest in England. The engines develop

The "Baby" Auto

2½ horsepower, and the machine will travel 15 miles an hour. The 5-year-old operator with his little sister is seen in the cut, which we use by courtesy of the Motor News, Dublin.

METAL BRUSH FOR CAR WASHING.

A metal brush which fastens to a pipe or hose, and throws a stream of water while in use, is a recent improvement for



Washing Cars with a Metal Brush

washing cars. Wooden brushes swell and become worthless in a short time. The metal brush lasts much longer.

It is a big task to keep hundreds of car windows bright and any invention which saves time and labor in the work is always in demand by up-to-date railway companies.

ELECTRIC HEATED RUGS.

So many things are electric these days we have long since ceased to wonder at the constantly increasing list. The electric rug is the latest, or was a few days ago.

The rug is made with a warp of fine copper wire covered with asbestos, with filling of wool. It has the appearance of any other well-made tufted rug; it is made as carefully, in fact, more carefully, than most rugs, and when charged with an electric wire attached to the ordinary electric fixtures of a dwelling it generates heat very rapidly and at little expense—for the small sized rugs something like a cent an hour. Now, the practical value of such a rug lies in its use by the bedside or in the bathroom. The floor partially or entirely covered with a wire warp fabric which generates a continuous heat will, to a great degree, prevent the colds and the discomforts of the fall and spring time when the house is not always heated. A hardwood floor is at best a cheerless thing to step on in the chill dawn of the morning, or to kneel upon in the sad hours of the night. With a few rugs around a room all electrically heated, the early riser can perambulate without chilling his pedal extremities, and can indulge physical culture stunts as he leaps from rug to rug; there will be practical reasons, moreover, for the maiden's indulgence of that prehistoric habit of squatting "Injun-fashion" as she dons her shoes and stockings.

The rug can be set "warming" by connection to any electric light wall socket and turning on the current. There is no danger of setting the house afire, as the heat is mild and the under side of the rug protects the floor.

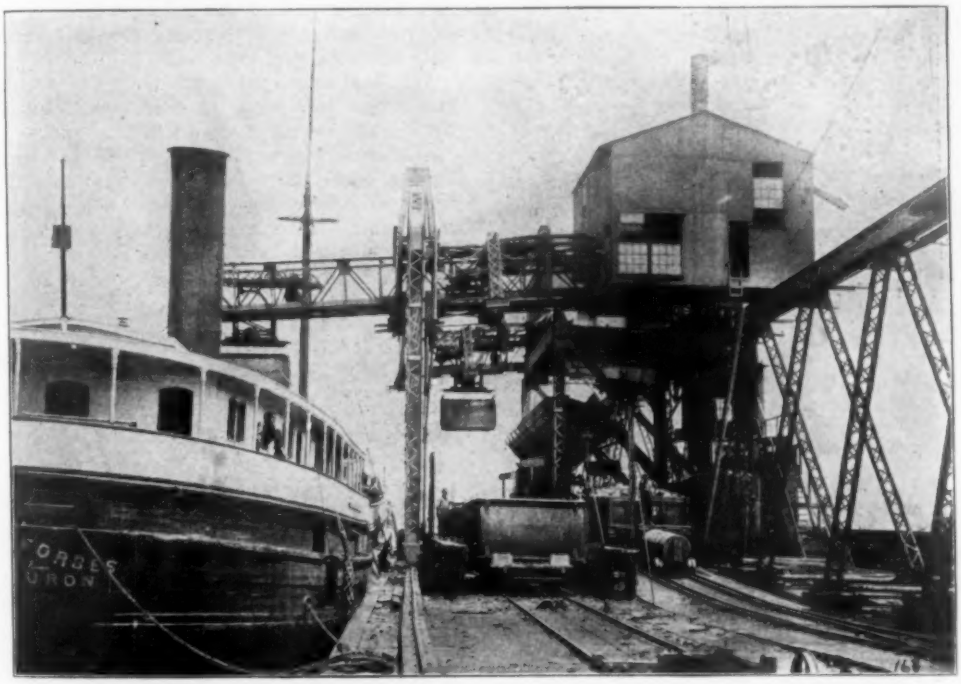
SAILORS ORDERED TO BLACK THEIR FACES.

One of the most curious orders given in the English navy is "All hands black faces!" And in order that this may be adequately fulfilled each of its warships carries among its stores a supply of such pigment as is used for the same purpose on the stage. This order is only given during the maneuvers, as a rule, for when a night surprise is intended it is not only the vessels that are made as little visible as possible, but the faces of the men must be blackened, for when powerful night glasses are used the showing of a white face is far more palpable than any landsman would suppose.

Some Remarkable Hoisting Machinery

How Coal and Ore are Handled at Important Lake Ports--Vast Amount of Work Done Almost Automatically

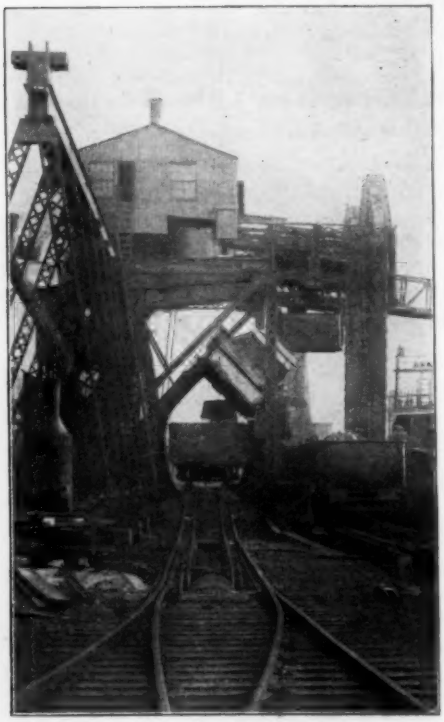
One hundred years have indeed wrought wonderful changes in the machinery and methods used in every line of industry. Twenty years have wrought startling changes! Up in Minnesota they tell a story of how twenty years ago the first carload of iron ore ever mined in that state was loaded at the Breitung mine and shipped to Two Harbors. The owner of the mines sent his son in 1883 to assume charge of the Iron Range railroad and the opening of the mines. The son, now United States Ambassador at the court of Berlin, promised that the first ore should be shipped August 1, 1884. He did it, but by a close shave. The huge Baldwin engine that drew the special train carrying Mr. Tower and a party of friends from Two Harbors to Tower, the scene of the event, scraped its paint against the rocks in the sides of the last rock cut on the way to the mines, and those who recall the event, declare they were barely able to get through, but the promise was redeemed.



The Conveyor Lifting a Tub--The Pusher Pushing a Car Into the Cradle

The party brought a carload of calico, beads, cheap jewelry, tobacco, pipes and fishing tackle for presents to the Indians, a large number of whom had been induced to be present by this means and the promise of plenty to eat. At sight of the plunging black monster with its escaping steam the red men fled precipitately to the woods and could not be prevailed upon to return for some time.

Everyone present helped to load that first car of ore. Some carried chunks of it to



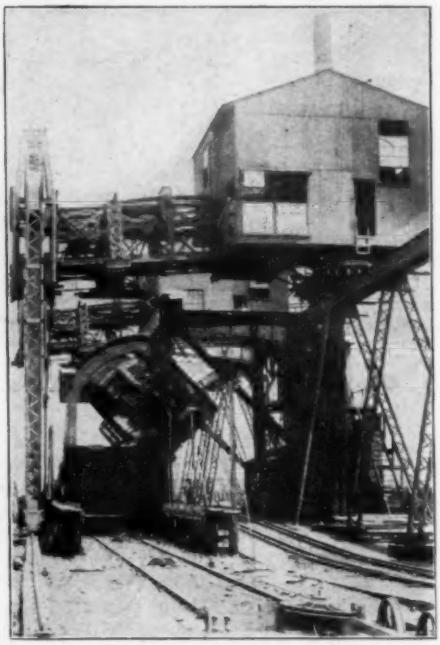
Position of Car in the Cradle--Pusher in the Center of Track Below the Level of the Rails so Next Car Can Pass Over It.

the car, while others wheeled a barrow full and no golden spike yet driven or ruddy wine splashed over a vessel's prow was ever the occasion of more merriment and felicitation. No Minnesota Indian could be frightened by a locomotive nowadays, and her carloads of iron ore only attract attention by their number and their value, but the incident shows what twenty years can do.

In this modern era, when mechanics are receiving more attention than ever before, an appliance may seem to be absolutely perfect for its purpose one day and on the next some great mechanical genius or expert may invent an appliance which will entirely do away with the old one, so great an improvement it is. Startling mechanical improvements are now wrought in a single day, oftimes. Rarely is it the mechanical genius, with all his natural proclivities, who works these great changes. More often it is the expert—the man, mayhap, who has spent years in hard study and daily experience of labor, who is familiar with every mechanical principle and its application; who is blessed with no sudden inspiration, but who knows how to apply his knowledge, and by the study carried on in overalls and with greasy hands and by exercising a clear insight and reasoning powers, knows how to put two and two together. Such men class as experts and are employed by many large concerns simply to study the machinery employed and see where it is susceptible to improvement.

To trace many of the important developments in machinery would require several volumes. This article has to do only with some of the wonderful forms of hoisting machinery found at the principal lake ports in the Union for the purpose of loading and unloading ore and coal.

For handling coal from cars to vessels huge coal tipples are used in many places. The loaded car is first run into a cradle by means of a car pusher, a cylindrical affair having double-flanged wheels, traveling in the center of the track and drawn by means of a cable. When a car is in place in the cradle the pusher backs along its track and down a declivity in the center of the track

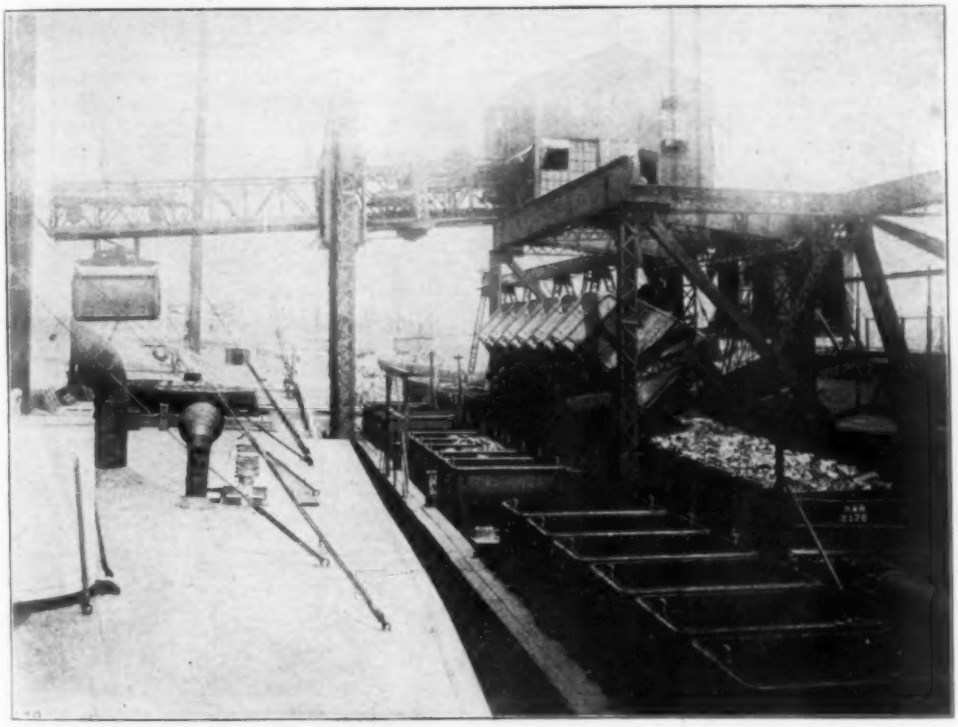


Cradle Turning Car Bodily Over so that the Coal is Dumped Through Chutes into Tubs.

until its top is below the level of the rails on which the cars run. The next car then passes along the track and over the pusher which then travels behind that car in its turn and pushes it up the grade to the cradle.

The frame of the cradle on one side of the car rises around the car like a huge crooked arm and holds at a slant above and a little to one side of it a row of chutes or pockets. The car is securely clamped in place by hydraulic clamps and is then lifted and turned bodily over, the coal, as the car turns, rolling into the chutes or pockets above it. These chutes, when the car is in the inverted position open inside of special tubs, and the cradle when righting leaves the coal in the tubs ready to be lowered into the steamer's hold. The loading is performed by means of conveyors which pick up these tubs and lower them into the hold, the bottoms of the tubs opening when the tubs are in their lowest position in the hold. With this system there is practically no breakage, which is of great importance when handling bituminous coal. Three of these tipples with conveyors have loaded easily 25,000 tons of coal in 22 working hours.

Of all the ore handled at the various lake ports last year, 90 per cent was unloaded by what is known as the "Brownhoist Bridge Tramway." This consists of a series of bridges built up along the docks, each bridge resting on a front and rear pier and each operating independently of the others. The span between the two supports is usually about 180 feet and underneath it the space is used for storing coal or ore, as the case may be, with room for tracks next to the front pier. Beyond the back pier of each bridge is a cantilever extension 92 feet in length, and at the front, extending over the boat to be unloaded, is hinged to the bridge proper an apron which is capable of being raised as the boat enters or leaves the dock.



Position of Tubs Beneath Chutes--Pusher Behind Loaded Car--One Tub Being Lowered by Conveyor into the Hold of a Vessel

Span of the Brownhoist Bridge Tramway, Showing Stores of Coal and Ore and Empty Cars Beneath

The operation of each bridge is controlled by one man and operates with either steam or electric power. The bucket which is thrust down into the hold of the vessel for its load is carried by trolley and the load can be dumped at any point desired. Sometimes the material is loaded direct into cars at the cantilever end. The bridge travels along the dock front so that it is not necessary to move the boat after it is once tied to the dock.

In this manner coal and ore amounting up to thousands of tons are handled quickly and cheaply and what once would have required a week's labor by many men can now be done in a day by the aid of a few.

How remarkable the extent to which power—steam and electricity—have taken the place of human toil! What are those who delve in earth and rock? That vast throng that daily troops into the subterranean passages that honeycomb the interior of this bounteous country and by the lurid flare of lamps ply pick and shovel against want and famine and cold? This gigantic, ingenious device, this child of a cunning mind, operated by this wonderful force, handles their entire output, which they toiled over with sweating brows and aching limbs; handles it without a groan, without a mishap, without a delay; every operation accurately timed.

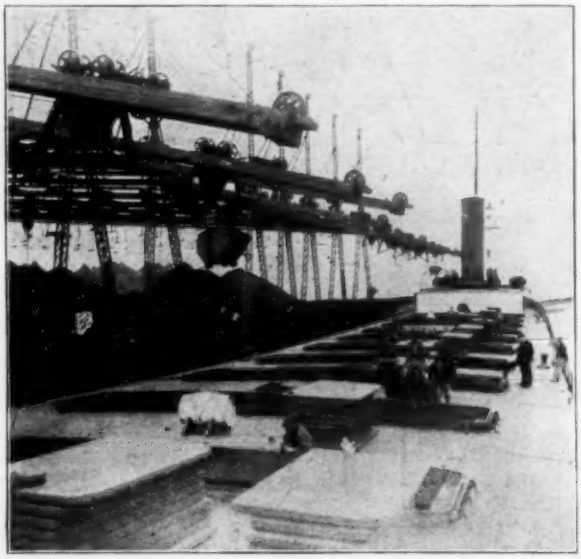
Perhaps the millennium will come when ingenious man has made every operation incidental to human existence automatic, and there is nothing left for him to work at or to contrive.

ARTIFICIAL GUTTA-PERCHA.

The demand for gutta-percha is so prone to exceed the supply that manufacturers are continually seeking a substitute for it. It is used for submarine cables, and for golf balls. In constructing cables it is used to insulate the conducting wire from the exterior metal sheath.

The German telegraph department has been testing some cables in which an artificial gutta-percha consisting of a mixture of india rubber and palm wax, the melting point of which is the same as of rubber, was used.

The cost of the artifical gutta-percha cable is about 35 per cent less than the ordinary cable, and its electrical properties are equal to those of the real thing.



Aprons of Brownhoist Bridge Tramway Extending Over Vessel--Bucket on One Apron

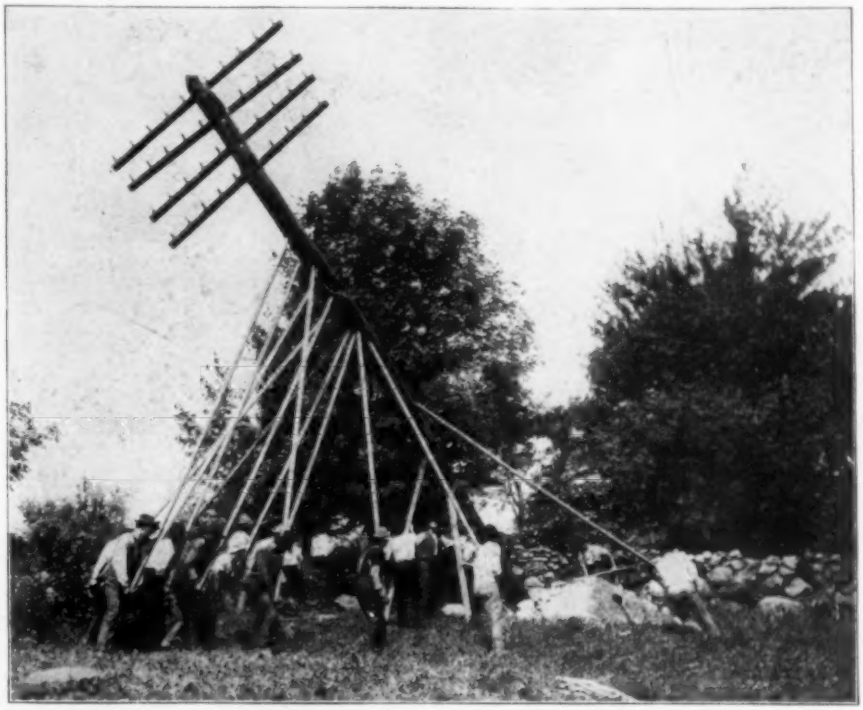
How Telephone Poles Are Set

Four Men in Two Minutes Now Do What Formerly Required Twenty Men

The modern method of setting telephone poles is in striking contrast with the old method. Telephone builders were many years in finding a method of pole-setting which was neither slow nor expensive.

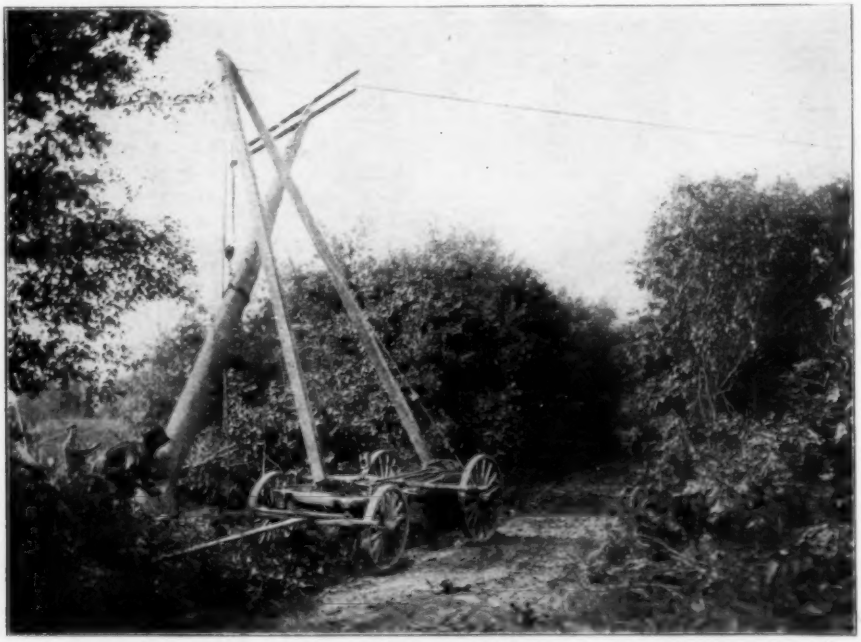
Several years ago the only recognized way to set a pole was by "piking"—that is, by lifting up the pole and then lifting it into place with long pike-poles, supporting it with a yoke when necessary to secure a new hold with the poles. This was hard labor for twenty-odd men and it was slow work. Of course it was realized that if a machine could be employed it would be a great saving in men, time and money. Several mechanical pole-setters of different design were constructed, none of which met with success. Finally the foreman of a construction gang invented a machine called a pole-derrick which satisfactorily filled the long-felt want in every particular, and was so simple in operation that designers felt ashamed that they had not thought of it themselves.

Mounted on a strong heavy wagon with one leg over each pair of wheels is an inverted V about 28 feet high. Rigged to the peak of this is a duplicate block and tackle, the one of steel and the other of 1½-inch rope. On the bed of the wagon is another block which forms the combination with the upper one and through which the rope, to which the horses are hitched, passes. The same team which pulls the wagon does the hoisting. The derrick goes into action in a very interesting and effective way. As soon as a pole is set the horses are hitched to the wagon and it is moved on to the next pole. Often this moving is a very ticklish business. The country is



"Several Years Ago the Only Way to Set a Pole was by Piking"

more often rough than smooth, and the four men who comprise the derrick gang have to be very careful in guying the swaying machine as it travels. Once arrived at the hole the derrick legs are leaned to the proper pitch and strongly guyed to nearby trees or rocks. Then a logging chain is passed about the pole at a place well above the balance point. While this is being done the horses are attached to the pull rope. The pole is then shifted until the cross arms may be put on. As soon as these are bolted and spiked the foreman gives the word, the horses start in a steady even pull and the pole rises. In less than a minute it swings clear. The men guide the butt so that it is over the hole and the horses back. The pole drops into place and is ready for the filling gang, who straighten it up and pack down the earth and rocks to hold it. From the time the pole leaves the ground to the moment it is set is seldom more than two minutes, affording a decided contrast with the time required to place it in the old-fashioned, man-handled way.



"From the Time the Pole Leaves the Ground to the Moment It is Set is No More Than Two Minutes."

One of these derricks was used in constructing a 60-wire line between New York and Boston, and it was found that this method of setting poles cost $20 less per day than the old way.

BUTTER GLAZED TO KEEP IT FRESH.

Nearly all the butter sold in forms in both England and Germany is glazed with a thin glass-like coating of sugar, says Consul-General Guenther, of Frankfort, Germany. The butter is first carefully kneaded and washed and then moulded in 1-pound forms and placed in a cool room. A hot sugar solution is painted over the surface to effect the glazing. A very soft brush is used and the painting done very rapidly. The hot solution melts the surface of the butter, and the sugar and melted butter form a varnish which keeps the butter pure and fresh and protects it from all deteriorating outside influences.

THAWING THIRD RAILS.

A system of thawing sleet and ice from third rail electric lines has been tested at Bridgeport, Conn. A steel wire is carried under the head of the rail and insulated from it. The temperature of the rail was raised from 15 deg. F. to 34 deg. F. in 15 minutes.

Taking subscriptions for Popular Mechanics is not only pleasant work but pays big commissions. Write for full particulars.

HOW TO SECURE A LIGHT WITHOUT MATCHES.

Touring automobilists may sometimes find themselves without matches and requiring light. In such case it is well to know how to secure a light without matches. The Automobile tells how it may be done.

If the car is fitted with jump spark ignition, disconnect one of the high tension wires from its plug; place the free end of this wire in such a position that it lays about a quarter of an inch away from the cylinder casting. Saturate a small piece of cotton waste or a piece of paper with gasoline and place over the free end of the ignition wire. Turn on the ignition switch and crank the motor. When the spark jumps from the free end of the disconnected wire to the cylinder casting, it will set the paper or waste on fire.

Be careful not to allow the blazing waste or paper to fall into the "apron," underneath the motor, if one is used. This "apron" is usually covered with grease and oil, and if it catches fire it may imperil the car.

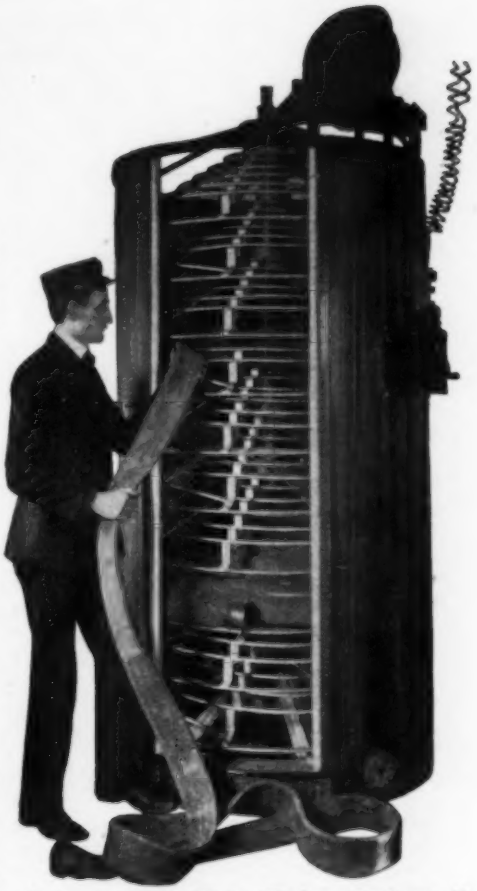
On machines having make and break ignition one wire should be disconnected from the insulated electrode in the cylinder. A piece of waste or paper saturated with gasoline, as previously described, is then laid on the cylinder head. The motor is next started and allowed to run slowly—on three cylinders. If the wire which has been disconnected from the sparker, as described, is now touched on and then removed from the cylinder casting or masse close to the waste, the spark resulting from the short circuit will ignite the waste or paper.

DRYING FIRE HOSE BY ELECTRICITY.

Does Away with the Old Hose Tower or Hose Rack in Engine Houses.

Rotary fire hose driers run by an electric motor are now coming into use in up-to-date engine houses for drying hose. Formerly the hose was carried up into the tower, built in the engine house for the purpose, and there hung up to dry. The job of hanging it up and taking it down again was by no means a small one, but the task was not only hard on the firemen but was also a strain on the hose, which is an expensive item in the station's equipment.

The rotary fire hose drier winds and unwinds the hose automatically and with less friction than in ordinary handling of it.

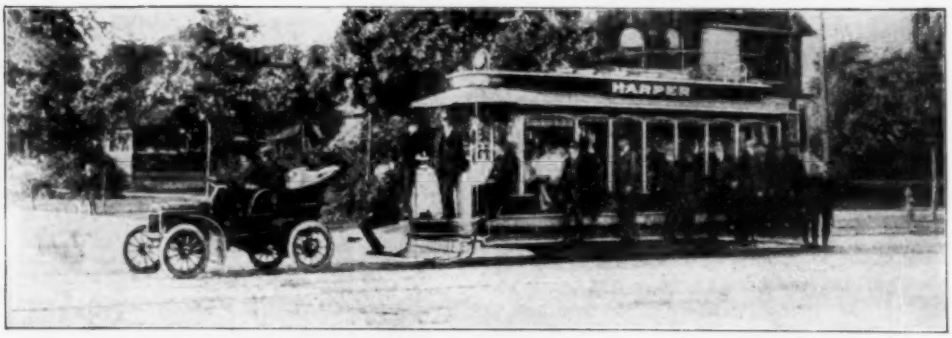


Rotary Fire Hose Drier Automatically Taking in Hose.

The exterior of the drier is constructed of hard wood and the interior is of iron, steel and brass. The electric motor is placed wherever most convenient, on top being a good place. The coils of the hose, when wound on the cylindrical racks, do not come in contact at any point.

The drier is closed and as easily as you turn on an electric light, so easily is the machine started. Its rapid rotation gives it one means of drying, and at the bottom of the cylinder a large fan rapidly revolving draws over the hose about 6,000 feet of air a minute. This carries off all the moisture and in a few hours the hose is perfectly dry, without having been subjected to any strain.

The drier occupies four square feet of floor space. Its speed can be regulated at will and one man can operate it, handling 500 feet of hose at one charge.



"The Auto Drew the Car Along at Its Usual Speed."

AUTOMOBILE DRAWS STREET CAR.

The owner of an auto in Detroit was boasting about the pulling abilities of his machine, and to make good his claims hitched on to a street car that was crowded with passengers. The auto turned out to be a first-class locomotive and drew the car along at its usual rate of speed. The illustration is used by courtesy of the Motor Age.

FIVE HUNDRED DOLLARS POPULAR PRICE FOR AUTOMOBILES.

Where there is one person who can afford to pay $5,000 for a luxurious automobile there are fifty who cannot pay more than $500, and these are waiting for the manufacturers to bring their prices down. Thus far the demand for high-priced machines has been sufficient to keep the factories busy on machines ranging from $700 up, but if autos drive horses from the streets it will be when present prices are very greatly reduced.

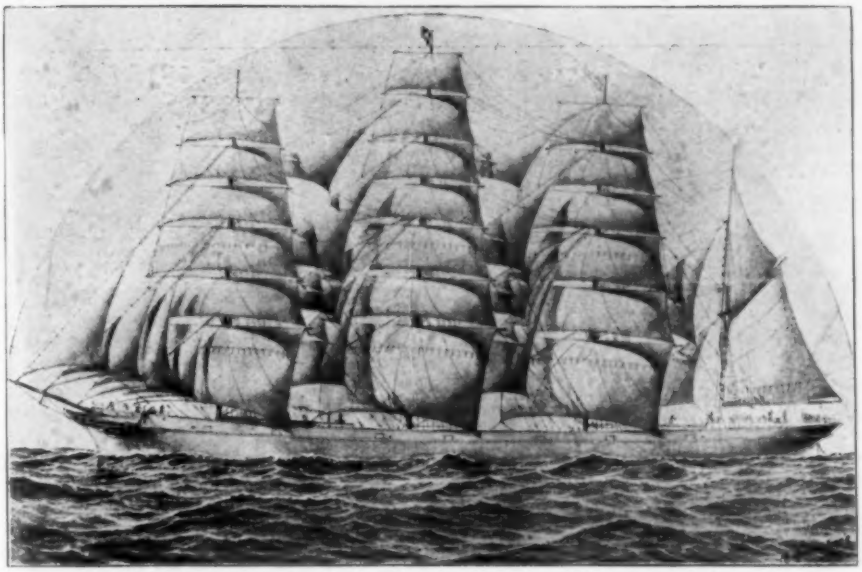
That $500 is a popular price was demonstrated a few days ago in this city. A dealer had a job lot to dispose of, and advertised them at the usual price, $750. No sales resulting, he tried them at $700, then $600, but without satisfactory results. Then he came out with an offer to close them out at an even $500 each, and they were sold in no time.

The masses want a safe, strong car, reasonably fast, and plain and simple in finish, and with the least possible number of contraptions. Before many years such machines will be available and will find ready buyers.

CARD DISPLAY DEVICE FOR TELEPHONES.

A new telephone adjunct is a holder for cards bearing the names and telephone numbers and exchanges of firms and business houses with which frequent communication is held. The cards, indexed in large red letters, radiate from the center of the holder and may be rapidly rotated until the desired name appears; a deflector holds them in position for ready reference. The device saves much time spent in looking up the same numbers again and again in the directory.

A Handy Telephone Attachment.



British Iron Shipentine "California," the Last Sailing Ship Owned by the White Star Line, of Liverpool

HOW CORN COB MEAL IS MADE.

Cob meal is used for stock food, but its manufacture has been regarded as a secret, and few people, even millers, know how it is made. An inspector for an insurance company gives the following account of the process:

Cobs are conveyed from cob warehouse by belting to the grinding and cleaning department, where they pass through separator, and all foreign material is removed and carried away. During this process all husks and chaff are removed by blower fan and passed to ironclad house on outside through metal pipe. This light stuff is later baled and shipped as material for mattresses.

The cobs are next conveyed by screw conveyor in metal trough to mill room, where they are elevated to third floor and passed to rolls through tin-lined spouting. During the milling process all pith and bee wings are removed by blower fans, conveyed to metal screw trough, where the heavier material drops to bottom and lighter is blown out to dust house. The heavier unsalable stuff is brought to boiler house and used for fuel. The only part of the cob used is the hard inner core, which is reduced to meal in the mill room, whence it goes to the large bins in the warehouse and packing room.

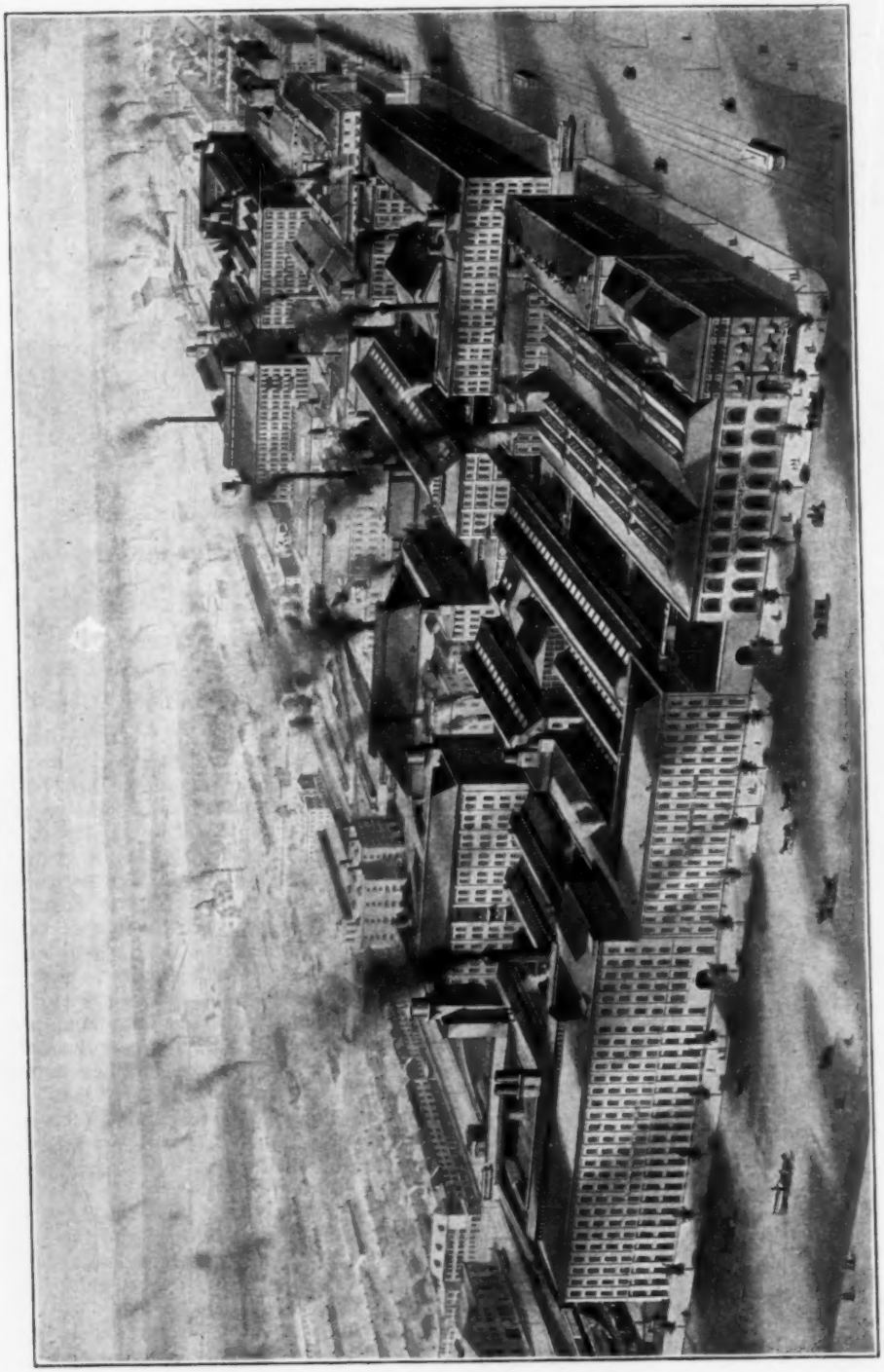
DIVING IN A MINE.

Nervy Work in Absolute Darkness

To don a diver's suit and plunge into water under the most favorable circumstances requires pluck and a fearless will, but when the water is 50 feet deep and at the bottom of a mine 1,100 feet below the surface the conditions are by no means improved. Such a feat, however, was recently performed in a deep mine in the far West.

An accident had happened to the big pump. The divers descended in absolute darkness, and made certain repairs by sense of touch and feeling that were necessary to start the pump, and it has been running since perfectly. The cost did not exceed $175, whereas, if a new pump had been purchased and put down it would have cost at least five times the expense incurred for the divers. It was a very unusual procedure, but a very successful one.

Large gongs placed on poles at important street corners are used by the Columbus Railway & Light Company to notify inspectors of breakdowns on any division of the line. The gongs are rung from the main office and the inspector communicates with the office by means of a telephone on the same pole as the gong, and is instructed where to go and what to do.



The Baldwin Locomotive Works--Philadelphia

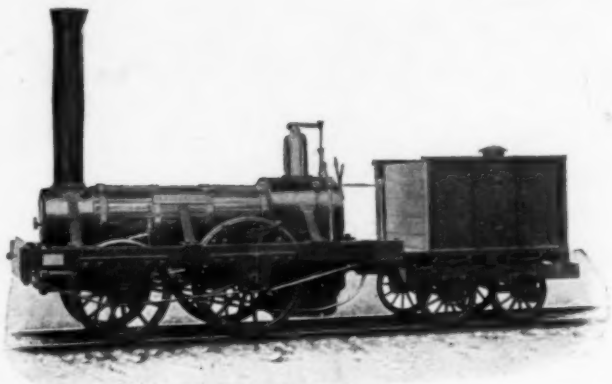
Baldwin Builds Six Locomotives a Day

Story of a Great American Industry--Employs 15,800 Men--Covers 37 Acres

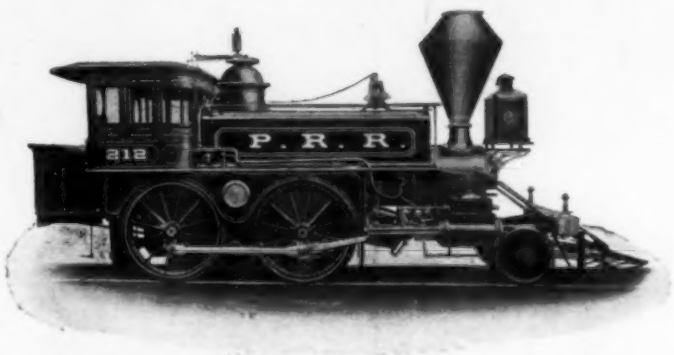
The Baldwin Locomotive Works, Philadelphia, was founded by Matthias W. Baldwin, when in 1832 he built the "Old Ironsides." A whole year was spent in its construction, and $3,500 was the purchase price. It went into service on November 23 on the Philadelphia, Germantown & Norristown R. R., which was operating 6 miles by means of horses. "Old Ironsides" was a great event, weighing all of 5 tons, with driving wheels 54 inches in diameter and front wheels 45 inches, the wheels having wooden spokes and rims and wrought-iron tires. Her cylinders were 9½-inch diameter with 18-inch stroke; the boiler was 30 inches in diameter and 7 feet long. Great difficulties were encountered in building this first locomotive owing to a lack of necessary tools. However, she did good service for a number of years, and is now honored and cherished far above the successors of recent days.

Thirty years passed, during which great improvements and inventions had worked many changes in locomotive building, and Baldwin pointed proudly to locomotive No. 1,000. It was built for the Pennsylvania railroad and had two pair of driving wheels. It was intended for light passenger work, and dispensed with a tender by carrying its water in a tank over the boiler. This machine weighed 23 tons.

The next 10 years were busy ones, during

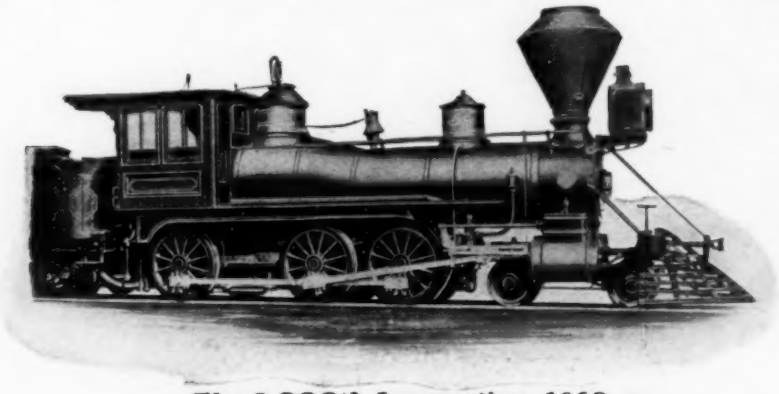


The First Locomotive, "Old Ironsides." 1832



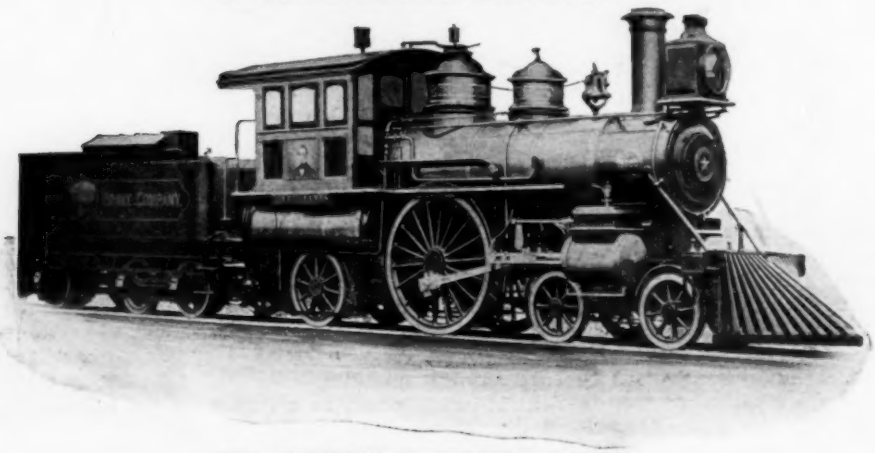
The 1,000th Locomotive, 1861

which a thousand locomotives were built, No. 2,000 being completed October 30, 1869. It shows a much greater likeness to present day types and was delivered to the Pennsylvania road. This was a soft coal burner, weighing 75,600 pounds, with 56,000 pounds on the driving wheels. The separate 8-wheel tender had a capacity of 2,400 gallons of water and 4½ tons of coal. Two hundred and fifty of these were built, and it happened that No. 3,000, which was finished in December, 1872, was of the same type



The 2,000th Locomotive, 1869

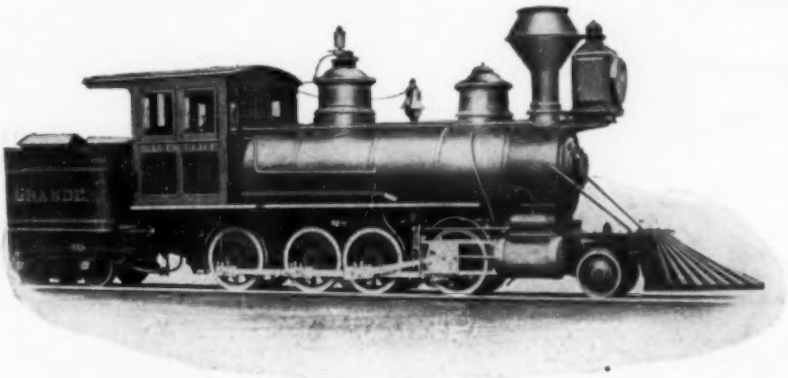
The 4,000th Locomotive, 1876



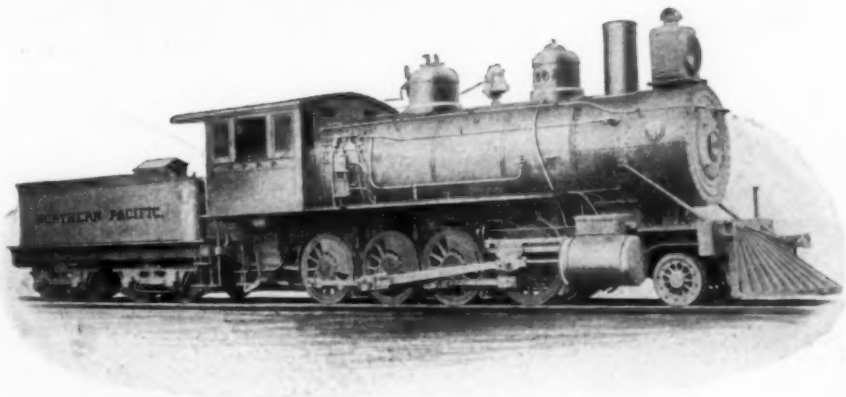
The 5,000th Locomotive, 1880

and size. No. 4,000, October, 1876, was considered handsome in those days. It weighed 35 tons, and shows the change in stack, but retains the low cab.

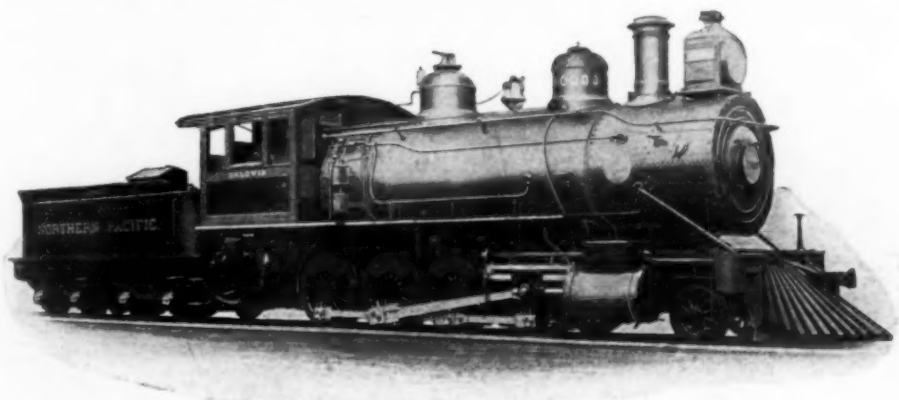
No. 5,000 was an effort toward greater speed, which the better tracks permitted and growing business interests demanded. It came out in March, 1880, and covered the



The 6,000th Locomotive, 1882



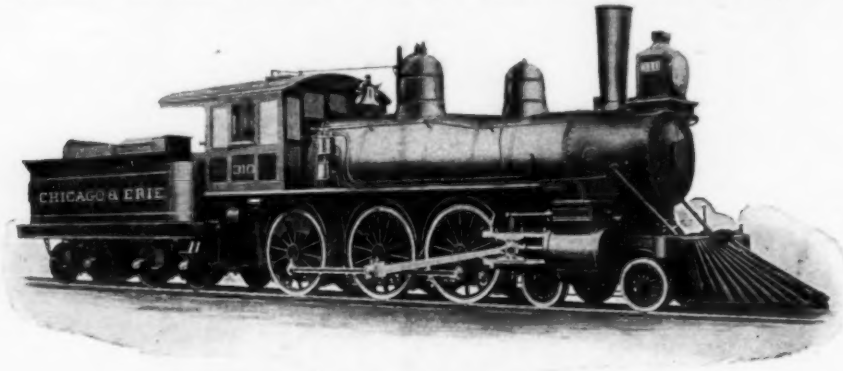
The 7,000th Locomotive, 1883



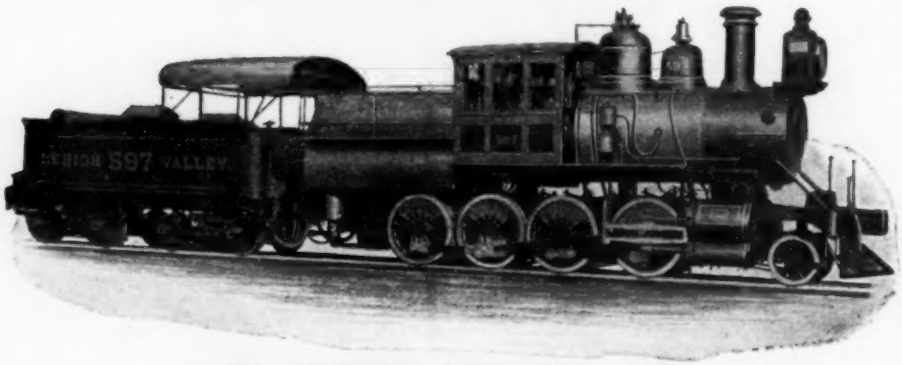
The 10,000th Locomotive, 1889

distance between Philadelphia and Jersey City in 90 minutes. It was afterward sold to an air brake company and sent to England to demonstrate the brake. The evolution of the stack is noticeable and a more roomy cab, which begins to approach in height that of the stack. The firebox is larger and the one pair of drivers were 78 inches in diameter. The entire weight was 83,200 pounds, with 38,300 pounds on the driving wheels. An auxiliary fulcrum was brought into play by means of a toggle joint operated by a steam cylinder which shifted 9,000 pounds more on the drivers when desired.

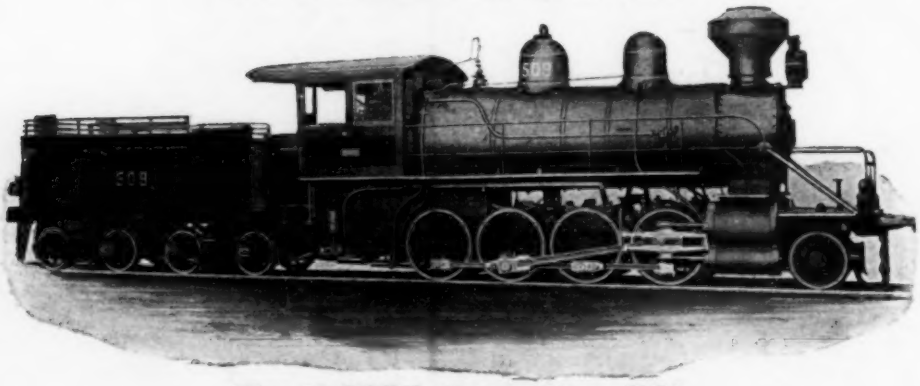
Locomotive No. 6,000 was built in January, 1882, and was one of the heaviest in use at that time on the narrow-gage roads. One hundred of this type were sent to the Denver & Rio Grande road. In working



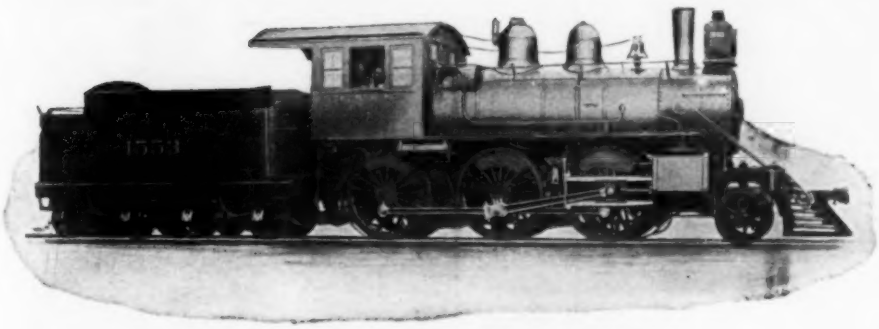
The 12,000th Locomotive, 1891



The 13,000th Locomotive, 1892



The 16,000th Locomotive, 1898



The 17,000th Locomotive, 1899

order the weight was 58,000 pounds, of which 50,000 pounds were on the drivers.

The capacity of the works had been increasing by the erection of additional buildings and the invention of labor-saving machinery, and in less than a year the output had reached the 7,000 mark. This locomotive weighed 110,000 pounds and went to the Northern Pacific road.

No. 13,000, which appeared in 1892, was then a new type, with the engineer's cab forward over the boiler. It weighed 141,600 pounds, had Vauclain compound cylinders and went into freight service on the Lehigh Valley road.

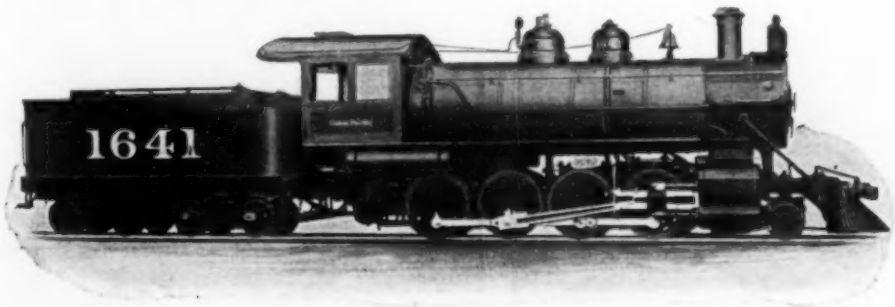
No. 16,000 is peculiar in appearance and interesting as having been built for the Moscow-Windau-Robinsk railway of Russia. Twenty engines were sent over at this time. No. 17,000 is a freight engine for the Chicago, Burlington & Quincy, and 18,000 was taken by the Union Pacific. No. 19,000, built in 1901, is a mammoth freight locomotive for the Illinois Central. No. 23,000 was turned out in October, 1903, and is known as the Santa Fe type, having a peculiar construction of the cylinders. No. 24,000, March, 1904, also went to the Santa Fe.

The progress made in 72 years from the little 9-inch cylinder of "Old Ironsides" to the Vauclain tandem compound system can be realized best by a study of the illustration, in which a portion of the walls surrounding one set of cylinders is removed to show the construction and operation of the valves. The picture was made from a model of actual size and is best realized by comparison with the height of the man standing beside it.

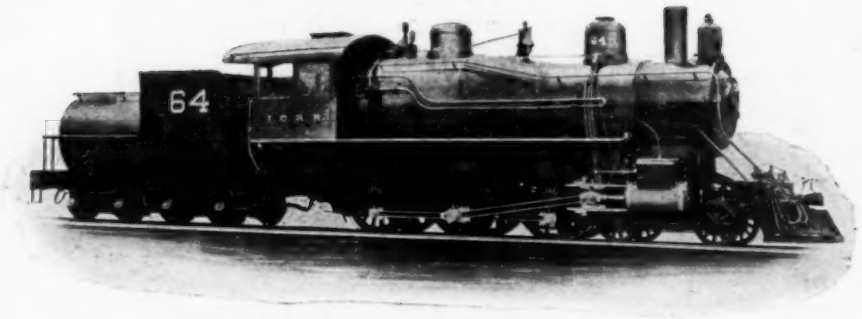
The locomotives illustrated in this story are all on exhibit at the Exposition in St. Louis, many having been loaned by railroads for the purpose, to be returned when the Fair closes; the others are the property of the Baldwin company.

This brief pictorial history of the progress of locomotive construction represents the extension and expansion of the great railway system, which has reached out in all directions until it covers the land from ocean to ocean and Great Lakes to the Gulf. The Baldwin works has kept pace and is now one of the great industries of the country.

The annual capacity of the works is at present 2,000 locomotives per year, with



The 18,000th Locomotive, 1900



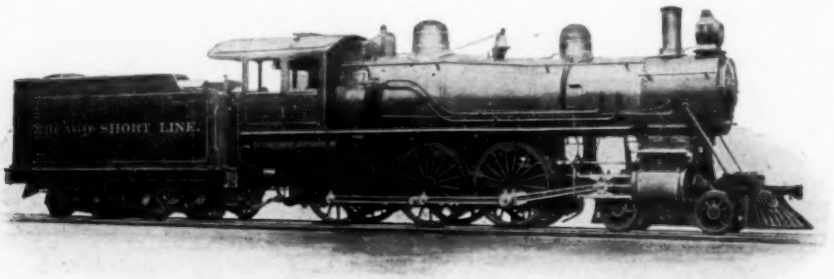
The 19,000th Locomotive, 1901

repair parts produced equal to 250 locomotives more. Work is carried on at the rate of over six complete locomotives each day. There are 39 buildings covering 17 acres of ground, with 37 acres of floor space, where 15,800 men are employed. The principal departments run continuously 23 hours a day. To drive the thousands of machines 11,334 horsepower is required. The works are lighted by 5,550 arc and incandescent lamps; 2,150 tons of coal are burned each week, and 5,000 tons of metal are used every six days—almost a thousand tons a day.

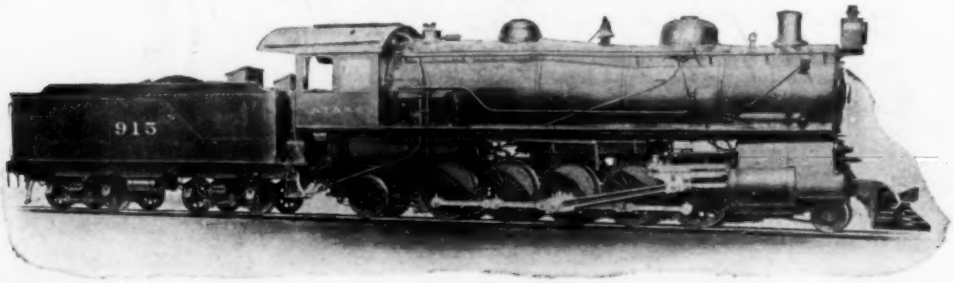
Matthias Baldwin builded better than he knew.

AMERICAN HORSESHOES FOR ENGLAND.

Tons of American horseshoes are sent to England every day, and the strange feature of the case is that they are made chiefly of English iron. The American Machinist says: In Poughkeepsie, N. Y., is an establishment in which many tons of horseshoes are made daily. Many of these go to England and are there nailed to the feet of omnibus and other horses working in London. A very large share of the scrap iron from which these shoes are made comes from England. Scrap iron is considered the best material for horseshoes, and it is not so plentiful as it once was.



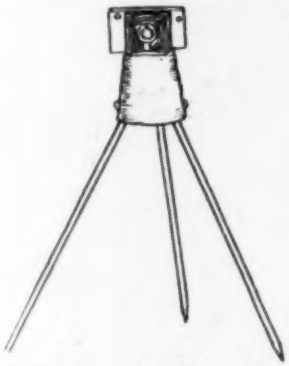
The 20,000th Locomotive, 1902



The 23,000th]Locomotive 1903

A HOME-MADE CAMERA TRIPOD.

For amateur photography it is wholly unnecessary to purchase a camera tripod, as a very satisfactory one can be made at home.

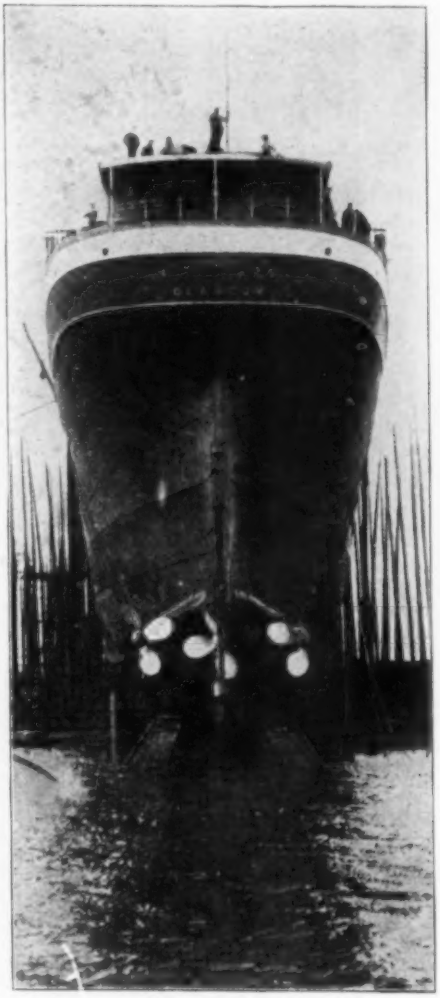


For legs select three 1x1-inch sticks 4 feet long and sharpen them at one end. Place the pointed ends of the legs downward and at points forming a triangle on the floor. Cover the upper ends with a lard pail placed upside down as shown in the sketch. Adjust the pail so that it is level and steady and the tripod is ready for use.

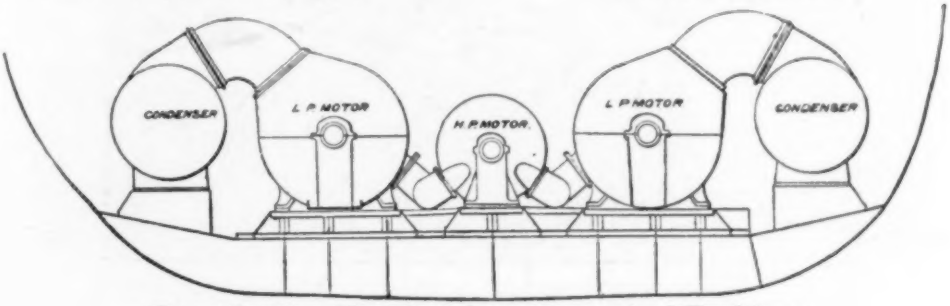
THE TURBINE LINER "VICTORIAN."

The launching, a few weeks ago at Belfast, of the first Atlantic turbine liner is considered in marine circles to mark the beginning of a new era in ocean-going vessels. The illustration is a cross section looking forward and shows the arrangement of the two condensers, the two low pressure and the high pressure turbine. The turbines, which are of the Parson's type, are the largest yet built.

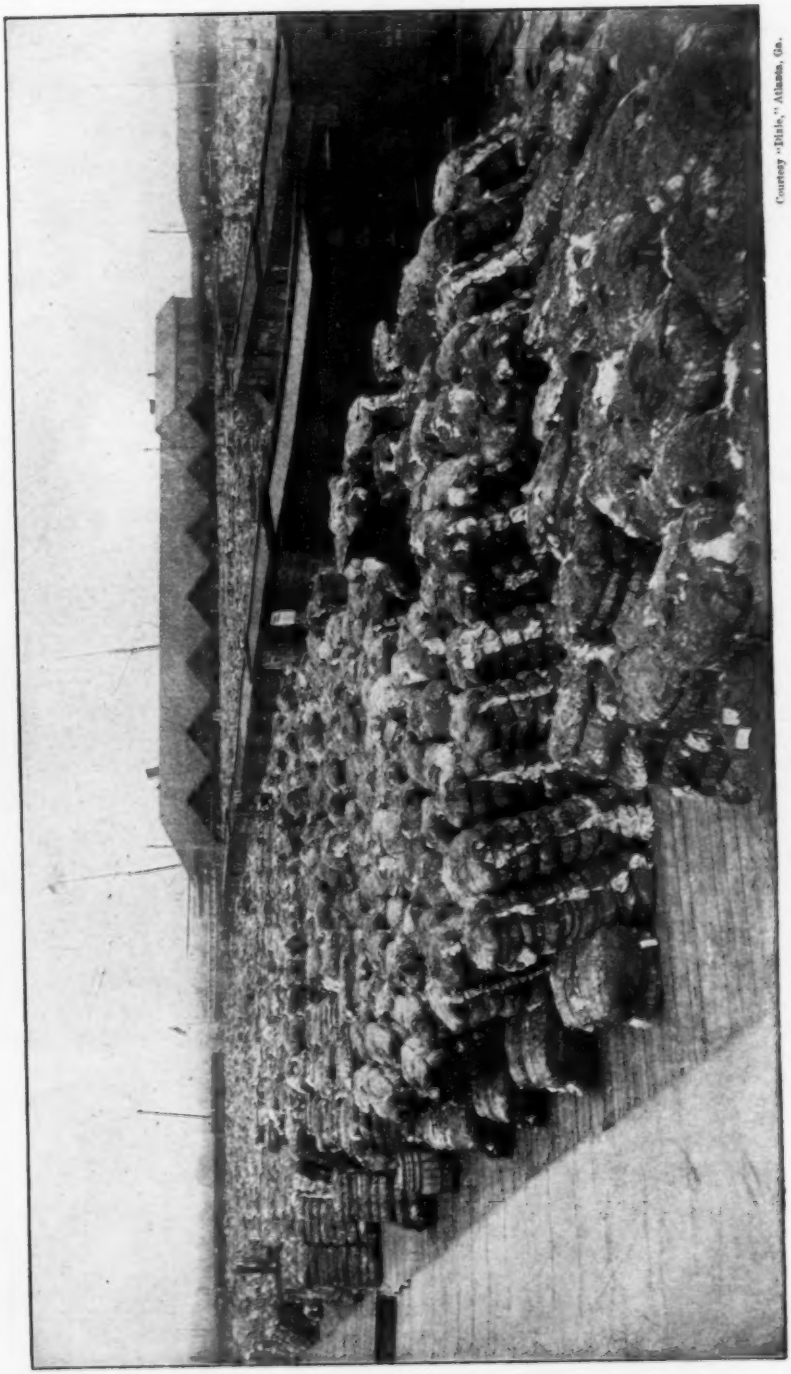
The "Victorian" is 540 feet long; breadth 60 feet; depth, 42 feet 6 inches, with a displacement of 13,000 tons. She is divided by bulkheads into 11 compartments which with the double bottom allow the vessel to have 20 distinct water-tight spaces. The Marconi system will be installed, and a refrigerating plant for the carriage of perishable freight. The vessel has accommodations for 1,300 passengers, and can carry 8,000 tons of freight.



Ready to Launch



Cross Section Showing Arrangement of Turbines



Courtesy "Dixie," Atlanta, Ga.

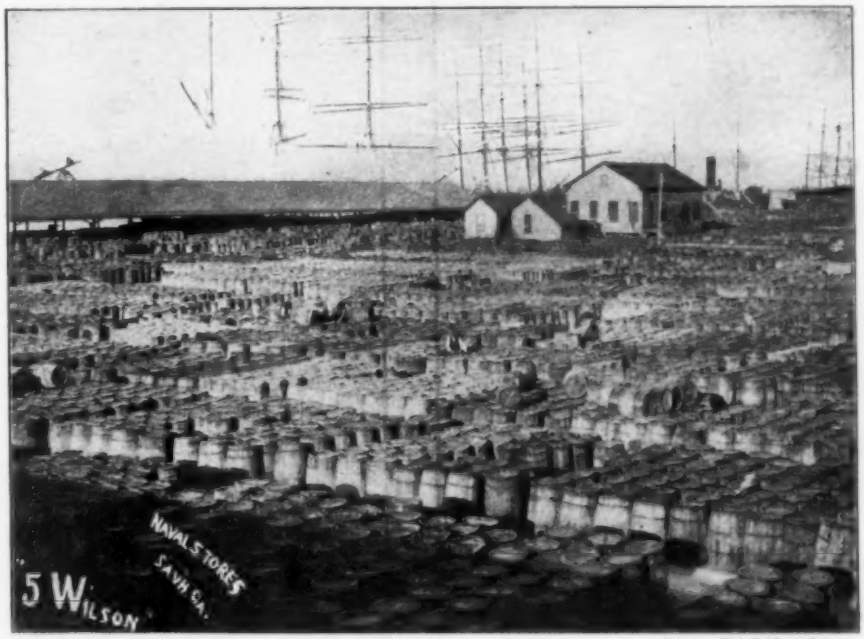
"Thousands of Bales are Exported from this Place Every Year." Cotton Wharves at Savannah, Ga.

Gathering the Cotton Crop

The first frosts have reached the cotton belt and already the bolls are bursting and opening their treasures. Cotton picking is a busy time in the South, and for the next few weeks the pickers by thousands will be gathering, the gins will be piling up the white stacks, and the balers, and teamsters, the steamboats and railroads will be rushed to their full capacity.

Already on the long wharves at the great export centers of the South lies heaped millions of dollars of the wealth of these United States. Not, to be sure, in glistening heaps of coins or bundles of bills, but in that substantial form which represents a rich and productive soil and healthful, soul-developing human toil.

Savannah, Ga., is one of these representative business centers of the South. Located as it is on the Savannah river where vessels of 14 feet draught and upward discharge, and load three miles below the harbor, and defended by Forts Pulaski and Jackson, its great wharves are scenes of teeming industry. Rice, cotton, lumber and many other important products are brought thither to be loaded on great vessels and carried to other ports. Of cotton alone hundreds of thousands of bales are exported from this place every year and the sum total of Savannah's exportation amounts to many millions of dollars each year. A vast space on the wharves is given up to naval stores.



Courtesy "Dixie," Atlanta, Ga.

Naval Stores and Lumber Docks at Savannah, Ga.

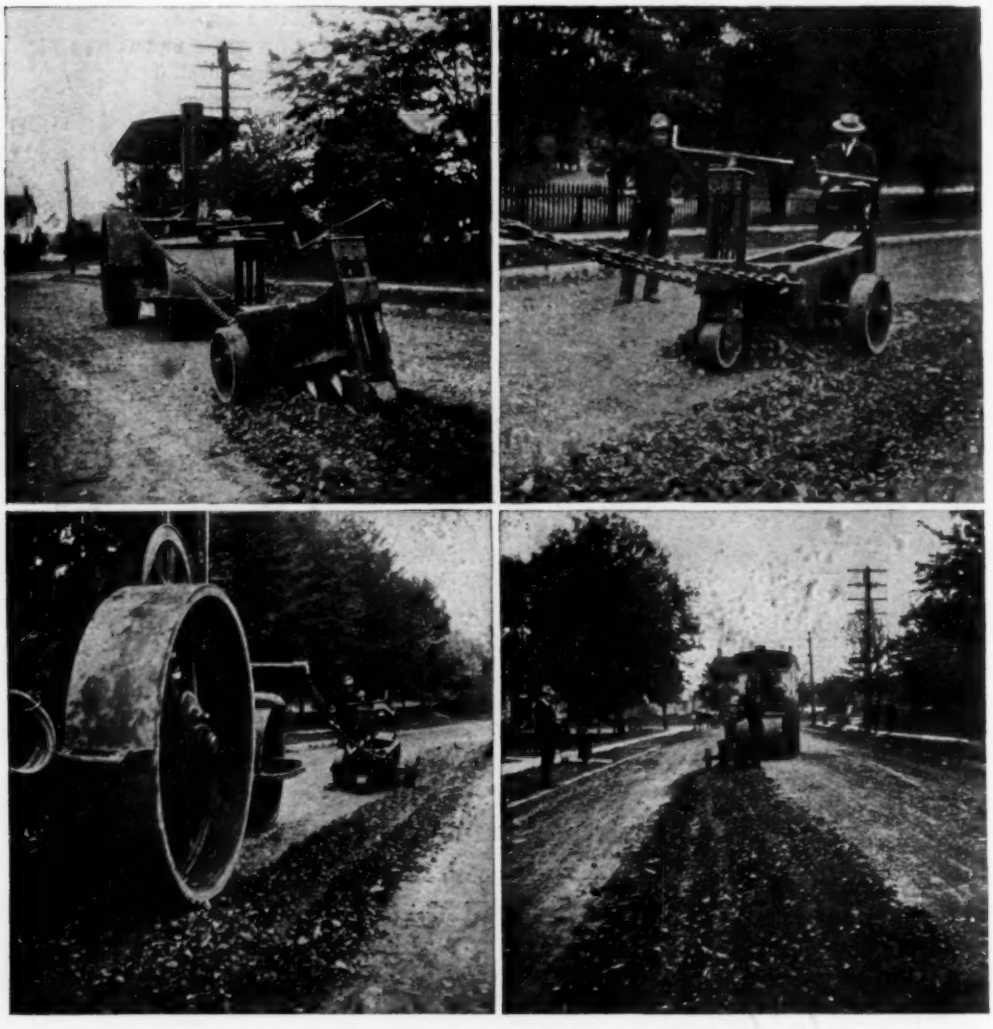
AMERICAN COASTS PROTECTED BY ELECTRICITY.

Nowhere is the revolutionary change that electricity has wrought more marked than in the extent to which it has been put to use in our coast fortifications. No part of the equipment of the fortress is more important, now that the electric installation involves so many features.

Electric fans, electrically-operated ammunition hoists, telephones by which the whole system of fortifications, the commandants and subordinates are put into communication, electric searchlights, telegraphs, submarine mines electrically controlled, electric signaling lights, electric lights, electric clock circuits, all are in use, and in time, probably, among these will be numbered wireless telegraphy.

The "Porcupine," A New Machine For Repairing Macadam Roads

A new machine for repairing macadam roads called the Porcupine is attracting considerable attention from municipalities where the expense for road repairs amounts to a considerable sum annually. The machine is quite as ungainly in appearance as the animal after which it is named, but like that animal it has quills or spikes which do the work most effectively.



Four Views of the Porcupine in Position

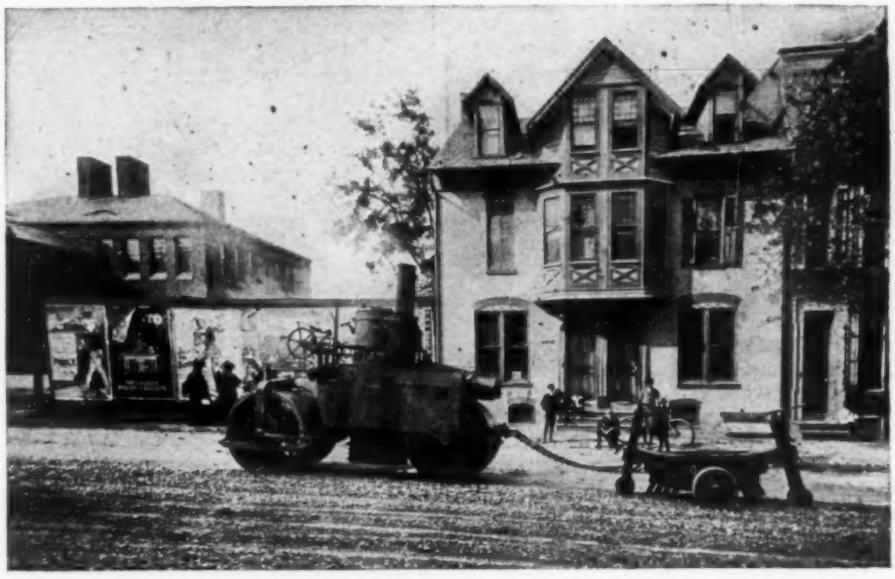
The Porcupine takes the place of the old, unsatisfactory and expensive method of hand picking the roads and breaks up the surface of the hardest macadam road from curb to curb, uniformly loosens and separates the particles that compose the surface, but without breaking the pieces of crushed stone and to a depth which removes all ruts and permits of reforming the street.

The machine weighs 4,000 pounds and, in the process of scarifying the road, is drawn by an eight or ten-ton steam roller to which it can be attached in a moment's time by means of a chain, and quite as easily

detached. The steam roller drawn the Porcupine to the end of the length of street under repair, one man regulating its operations. It does not jump or switch from side to side, but follows its course straight and true. If there are crossings to pass over its spikes are lifted until it has passed. When it has reached the end of the piece the roller laps over and draws the Porcupine back again, the machine scarifying each time for its full width and to any depth desired, the depth being regulated while the machine is in operation.

After the scarifying process the road can be harrowed to form a crown, if desired, rolled down, stone and dust added as a top dressing and then sprinkled, making a fine new street, perfect in every way and repaired at a minimum of expense.

One Porcupine with the aid of one steam roller has scarified a block of the hardest city street to be found, and the surface was then shaped up and rolled down, the whole process being done, by the labor of four men, between the hours of 10 a. m. and 6 p. m. This is a fair example of the amount it can do. In other terms it may be stated as able to thoroughly loosen 4,000 square yards in ten hours. The machine will work close up to the curb and while moving in either direction.



The Porcupine in Position

THE MAN BEHIND THE SHOVEL.

The way in which the man who shovels the coal into the furnace does his work has the effect of increasing or decreasing the cost of steam production, although it is hard to get mill owners to realize this fact.

Modern Machinery tells of a recent test which shows how different firemen working under the same conditions will produce different results. Four good stokers were put to fire the same boilers, all conditions being similar. There was a difference between the most and least expert of 23 per cent in capacity and 18 per cent in economy.

The raw material that passes through the hands of the fireman is one from which there is no by-product. As a rule, he does his best and maintains a fairly even steam pressure. He knows that the less coal he throws in the lighter is his labor, but beyond this he has no incentive to economy. Yet he is the one who can effect economies. Some of the larger plants have introduced a coal bonus, which is divided among the firemen who show best results. This plan might not be feasible in small plants where only one or two men are employed, but in such cases the manager can interest himself to the extent of seeing that coal is used intelligently.

STUPENDOUS PROJECT OF BRITISH SCIENTISTS.

Plan to Dig a Hole Twelve Miles Deep—To Cost $25,000,000—Time Required 85 Years.

The British Scientific Association are seriously considering the plans for sinking a giant shaft many miles below the surface of the earth, and estimates of expert engineers place the cost of a 12-mile deep hole at $25,000,000, and allow 85 years for the completion of the undertaking.

While the scheme may at first thought seem an insane one, is it really any more so than the ever recurring attempts to reach the North Pole? As a matter of fact the project is more likely to be productive in valuable knowledge, and there is even the possibility, though not the strong probability, that rich minerals may be found to reward the projectors, or their posterity.

Two deep holes, each about one mile in depth, have been sunk, one in Silesia and another in South Africa, but no one has ever previously planned to go down 10, 20, or 50 miles into the bowels of the earth and diagnose the symptoms there prevailing. The plans and estimates of the work are already well started under the direction of the Hon. Charles A. Parker, of the Engineering Section of the British Association. The engineers assume that for the first four or five miles the temperature would not be unbearable, but below that point resort would be necessary, to air locks and a freezing process which would make the hole tenable to human existence. The experts have that all planned out, however, and the freezing system of M. Poesche, a noted Belgian engineer, is believed to answer all the requirements for the second 12 miles or so.

Depth.	Cost.	Time in years.	Temp. of Rock.
2 miles.....	$2,500,000	10	122 deg. F.
4 miles.....	5,500,000	25	122 deg. F.
6 miles.....	8,000,000	40	182 deg. F.
8 miles.....	13,500,000	55	212 deg. F.
10 miles.....	18,500,000	70	242 deg. F.
12 miles.....	25,000,000	85	272 deg. F.

The possibilities of a rich "find" are certainly attractive: it may be a bed of diamonds, or other precious stones. There may be strata of gold or silver as great as those of hard coal in Pennsylvania; or vast ledges of mercury or tin, or even the more common but still highly valuable deposits of lead, or copper, or zinc. In any event the geological discoveries could not fail to outrank many times any results possible to bring back from either the South or North Pole. The more one reflects on the undertaking the greater the desire to know what is down below us, and whether a single rock stratum is miles in thickness. Canyons on the surface show frequently several strata.

Then there is the possibility of tapping a great lake of oil which could not be exhausted in centuries; or some heat-giving center which might last for thousands of years. With electrical transmission perfected to its fullness might it not be possible to send to all parts of the world electrical energy for power; or for transformation into heat that would temper the Arctic zone until the vines and fruits of Italy could bloom throughout the year.

All this sounds chimerical: but is it?

We know much; but not all knowledge will pass away with this generation.

How long did Galileo contend for his theory? And to how many was it given to really believe that Columbus was other than an insane rover?

The ancients did many things we are still vainly trying to imitate, and every little while evidence appears that some of our proudest achievements were practiced thousands of years ago. However, history inclines to the belief that their efforts were directed toward raising lofty towers and rearing pyramids rather than digging holes in the ground.

Have we then at last really discovered something new to do? If so, let us all cheerfully chip in and put in operation at the earliest possible moment the deepest hole which has ever been dug by any world.

HOW TO MARK TITLES ON NEGATIVES.

Marking titles on negatives so they print white on the picture is a very simple matter and may be done in either of two ways.

Write the name backward on a corner of the negative where there is a shadow, using India ink, or write it upon the paper before printing, using India ink in that case, also. The ink will wash off in the after-treatment and leave the title in white lettering, says the American Amateur Photographer.

It is rumored that two big American shipbuilding yards have taken contracts, one to build a fair-sized navy for Japan, and the other for 13 torpedo boats for Russia. The contract with Japan calls for 14 battleships and cruisers. At Lewis Nixon's ship yards at Perth Amboy the skeletons of 10 torpedo boats, each 100 feet long, have taken shape. The boats will be propelled by standard gas engines.

BRILLIANT ELECTRIC DISPLAY AT A SAN FRANCISCO EVENT.

The electric illuminations on Market street, San Francisco, during the convention of the Knights Templar recently held there

"The Street For Many Blocks Was Clothed in a Scintillating Effulgence of Electricity"

was one of the most brilliant and beautiful displays of the kind ever made in this country. Thousands of lights with varihued globes were used in carrying out the elaborate decorative designs, and the street for many blocks was clothed in a scintillating effulgence of electricity.

We are indebted to W. L. Woodworth of San Francisco for the illustration.

ELECTRICITY FOR STEAM ROADS.

In an address before the Electrical Congress in St. Louis, B. J. Arnold said:

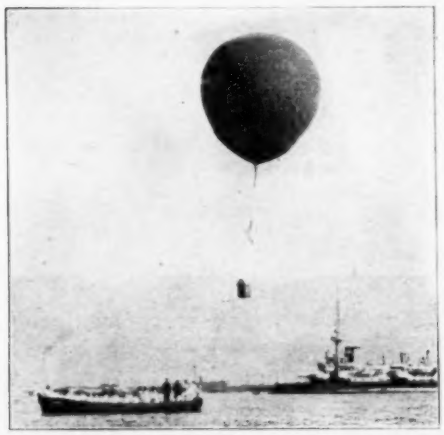
"It may be taken as axiomatic that when investment is taken into consideration, power cannot be produced in a steam central station, under conditions that exist today, and transmitted any great distance to a single electrically propelled train, requiring from 1,000 to 2,000 horsepower to keep it in motion, as cheaply as a steam locomotive, hitched directly in front of the train, will produce the power necessary for its propulsion. Therefore there must be other reasons than the expected economy in power production to warrant the adoption of electricity on a trunk line railway unless it can be shown that the trains are frequent enough to make the saving in the cost of producing power greater than the increased fixed charges made necessary by the increased investment due to the adoption of electricity.

That electricity will be generally used on our main railway terminals, and untimately on our main through lines for passenger and freight service, I am convinced, but I do not anticipate that it will always be adopted on the grounds of economy in operation. Neither do I anticipate that it will come rapidly or through the voluntary acts of the owners of steam railroads, except in special instances.

During August 8,649 pieces of baggage were handled daily at the Union station, St. Louis. This is nearly twice the amount handled during August of last year and 41,000 pieces over July. A remarkable fact is that trunks composed 94 per cent of the baggage handled.

FRENCH TEST NAVAL BALLOON.

In aerial navigation the French are ahead of all other nations of the world. Even the wily Brazilian, Santos Dumont, claims it as the loved country of his adoption. Re-



Test of French Naval Balloon

cently the French Navy has made thorough and severe tests of a balloon as a naval adjunct. The French are sanguine of the ultimate success of the balloon and the airship as important features of all great navies.

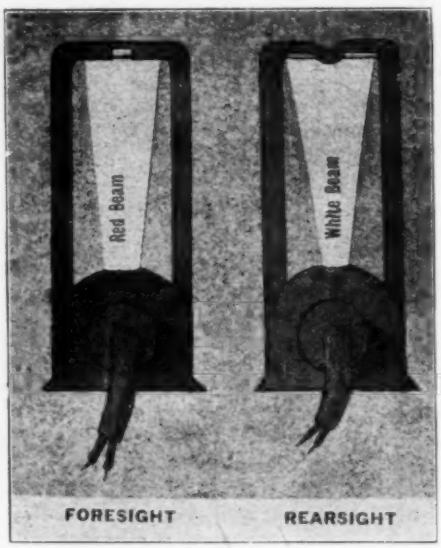
ELECTRIC NIGHT SIGHTS.

A ship engaged in a night attack is shrouded in complete darkness which is secured by closing all the dead-lights with which every scuttle is fitted, and switching off the dynamo from the incandescent lamp circuit. No lights of any description are allowed on the upper deck, and the consequence is that the guns have to be worked in complete darkness, this necessitates the use of "night sights." These consist of tiny lanterns containing very small glow lamps which are rendered incandescent by batteries.

The lanterns are joined in fork to the battery, and are easily shipped on to the ordinary day sight. Now the form of sight used in daylight is as follows:—The foresight consists of a "pea" or bead mounted on a knife-edge, and is fixed—that is to say, it does not alter its position to allow for deflection or distance; the rear sight, on the other hand, may be screwed laterally along a scale to allow for deflection and windage, and can also be raised or lowered vertically according to the range. It is H-shaped, consisting of two uprights crossed by a thin bar. In order to get a correct alignment the captain of the gun trains until the bar of the rear sight directs the "pea" for elevation, and until the "pea" is exactly sideways between the uprights for direction.

Now very naturally the captain of the gun being used to this method of sighting requires as close a representation of the bar and "pea" for his night sights, as possible, and a very good imitation is obtained by reflecting the light of the rear sight in the form of a bright line, and that of the fore sight in the form of a bright spot.

For this purpose a U-shaped piece is fitted on to the lantern immediately above the beam of light, and in the fore sight a tiny mirror of polished metal is let into the center of the inverted U frame at an angle of 45°, this reflects the light in the form of a small red speck. The rear sight has a slight depression in the center on either side of which a strip of polished metal inclined at



45° reflects a line of light broken in the center where the depression is. The reflection of the fore sight is red, and thus the captain of the gun trains until his red spot is just filling the break formed by the depression, in the line of light that is visible as a broken white band upon his rear sight.

The United States owns 1,200 steamships, while Great Britain has 8,500.

THE TELEPHONE IN THE WHITE HOUSE.

Where and How the President of the United States Holds Telephonic Conferences and Sends Telegrams and Cablegrams

One of the busiest spots at the White House is the Telegraph and Cipher Bureau, which is never closed, day or night, year in and year out, and where hundreds of messages dealing with vital affairs of state and having to do with the welfare of a great nation are received or sent daily. In all, 65 wires converge in this room and, including the President's private code, telegrams and cablegrams are sent in 10 different codes.

President Roosevelt will not have a telephone instrment in his private office, but goes to the telegraph and telephone room in the White House, where he is frequently engaged in long-distance conversations for some time, as during the anthracite coal strike when he was thus engaged with the leaders of both sides, frequently for long intervals. The central telephone station in this room is so arranged that the President can talk with any government official in Washington without the message passing through the city central office.

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Telegraph and Cipher Bureau at the White House

PROGRESS OF MARCONI SYSTEM.

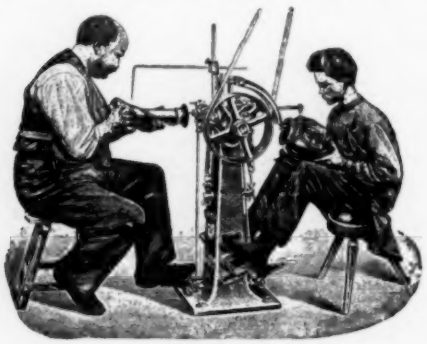
The Marconi system is now successfully transmitting messages 1,500 miles to sea, which leaves a gap of about 500 miles which is not positively covered. That is, a vessel sailing from Liverpool is in communication with the English station for the first 1,500 miles and is then without service for 500 miles, or until it enters the 1,500-mile zone served from the station on this side. Marconi having accomplished this, shall we doubt his ability to connect up the entire distance? His visit to America during October was to arrange for greater power which he believes will solve the difficulty.

While here he stated: "Though thus far the experiments have been imperfect, they have mainly failed because of lack of power. I purpose to increase that of the Cape Breton station, and I have new appliances for a more perfect radiation for the

electric waves. I believe that I can overcome the long distance with more power. The Cunard steamships now get their bulletins readily and accurately when 1,500 miles from shore. With sufficient power the remaining distance across the sea can be overcome, I believe. Recent experiments in Italy developed curious phenomena which distance only cannot explain."

INGENIOUS EMBOSSING MACHINE.

Decorations on metal vessels have been largely the result of hand work, and consequently expensive. When these figures are raised the process is known as relief work; when they are indented, it is repoussé. A German inventor has produced a machine which will do both processes,



Embossing Machine

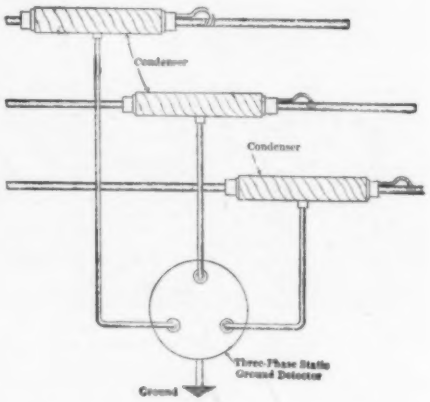
which he accomplishes by small, pointed hammers—one outside and one working inside the vessel. The Metal Worker describes the process thus:

In effect, the work is done as follows: The design is either drawn or stenciled upon the outside of the vessel to be decorated. The arm of the embossing machine, upon the end of which a hammer is fixed, is introduced into the neck of the vessel, and is followed on the outside by a pointer, which shows exactly where the head of the hammer will come in contact with the metal within. The belt is then shifted and the machine is started. Three speeds are at the disposal of the operator; namely, 900, 1,200 or 1,600 taps of the hammer per minute. The pointer is held directly above the point of attack, and, though out of sight, the hammer must strike directly under it. Variation in the force of the stroke is often desirable, and for this provision is made, the varying force being produced by a pedal placed within convenient reach of the operator's foot. A strong pressure upon this pedal will stop the machine altogether when necessary.

THREE-PHASE STATIC GROUND DETECTOR.

An instrument is now available for testing grounds on three-phase circuits of from 1,000 to 50,000 volts potential. The previous method of combining two or three single-phase instruments has been unsatisfactory because slow. The diagram, from the Street Railway Journal, shows how the new device operates.

It will be seen that each of the three fixed vanes is connected to a line of the three-phase circuit. The central movable vane is electrically connected to the case, which is grounded. When there is no ground upon the circuit the attraction or pull upon the central vane from each of three fixed vanes is balanced and it does not deflect from a central position. Should one of the lines become grounded, and the potential of that line become the same as that of the movable vane, there will be no pull in that direction, and the movable vane will be deflected away from the grounded line. The instrument is reliable in its indications and is not complicated.



In the diagram the three leads to the ground detector are shown with a condenser inserted between each line and the instrument. This obviates the necessity of carrying high-tension wires to the front of the switchboard. Each of the condensers consists of a brass tube covered with insulating material and placed within a copper sheath, the line being connected to the inner tube and the lead to the copper sheath.

Harvesting Grapes in America's Vineyards

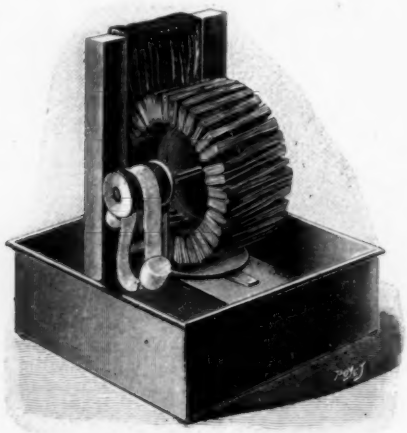
A Vineyard Scene Typical of Michigan, New York and Many Other American States Where Grapes Are Purpling for the Harvest, in Great Lucious Clusters

Where Hundreds of Thousands of Grape Baskets Are Turned Out Annually

A CAPILLARY MOTOR.

Little Invention May Lead to Important Applications of the Principle.

A Frenchman, M. Leboyer of Riom, has contrived a little motor out of a few pieces of blotting paper, some rocks and a piece of tinder which utilizes the capillarity of certain substances for liquids and turns it into a force. The little motor is very simple in operation and may lead to further important developments.



A Capillary Motor

We all know how readily the wick of a lamb absorbs oil and carries it far above the level of the liquid through the burner where it feeds the flame. One may experiment by holding a strip of blotting paper vertically in a little water and noting the height above the water to which it becomes moistened by this same capillary action. This power of imbibing water varies, of course, with the substance. The inventor of the capillary motor, who has a most observant eye for natural phenomena, discovered a rock which imbibes liquids when placed vertically in them, sometimes to a height of four inches above the level of the liquid.

In making the motor he placed two oblong sections of this rock vertically in a basin full of water and at the top between the two rock supports arranged a piece of amadou or German tinder, a very porous inflammable substance made of fungus growth. The lower end of the tinder came in contact with a wheel formed of blocks of blotting paper placed edgewise, around its whole circumference. Upon the axle of the wheel is arranged a band carrying two tiny buckets. The water rises through the rock supports, is imbibed by the porous tinder and again by the blotting paper wheel which the tinder touches. The whole left side of the wheel becomes so heavy with water that the wheel turns and once more its equilibrium is established by the rest of the wheel absorbing water. When the water in the opposite side has evaporated sufficiently to again destroy the equilibrium the wheel again turns. The rapidity of the revolutions depends of course on the condition of the atmosphere. In the meantime the little buckets rise and descend with every revolution of the wheel lifting water about four inches. The motor, of course, acts very irregularly and lifts only a little water in 24 hours.

The motor can be easily constructed by anyone who wishes to try the experiment for himself.

AUTO REPLACES MULE.

The superintendent of a big sugar plantation in Louisiana has adopted an automobile for inspection trips over the fields.

Inspecting Sugar Plantation

The roadways are kept up in good condition on account of the great amount of hauling during the year, and the change from mules to machine was an easy one and a great saving in time.

In the million dollar subway at the Union station, St. Louis, no provision was made for drainage. It filled with water a few days ago and will have to be reconstructed before use.

A COASTER CLOCK.

Rolls Down Hill for 24 Hours—Requires No Winding—Keeps Perfect Time.

A watch and clock-making establishment at Zurich has invented a clock which keeps time by rolling down hill for 24 hours. This mechanical freak spends the entire 24 hours

Fig. 1

in going to the bottom of the plane once. The distance it travels in that time is about 15½ inches and the clock rolls constantly but almost imperceptibly.

The clock is made in the form of a cylinder and the plane base is tilted at an angle of 20 degrees. When the clock reaches the bottom of the plane it is simply lifted up and placed at the top again. The clock has no spring and therefore requires no winding. The numerals on its face read from right to left instead of, as usually, from left to right. Along the upper edge of the inclined base is another time scale, the figures of which correspond exactly with those on the face of the clock. In indicating the time the numerals on the clock face pass behind a hand which always maintains its vertical position, despite the rotation of the cylinder, the upper end of the hand indicating the time by the numerals on the clock face and the lower end pointing to the corresponding numeral of the scale on the edge of the base.

"This invention though startling is very simple and not at all new," says the Keystone. "It is very clearly described in a book of mathematical and mechanical curiosities published in 1719."

The same paper goes on to explain the interior mechanism of the clock, referring to Fig. 2. Within and at the center of the cylinder, C, is fixed a strong clock movement, M, without a barrel. The apparatus thus constructed is balanced with the greatest care, for it is an indispensable factor in its proper working that no inequality of weight should be found upon the circumference of the cylinder. Placed upon an incline it is evident that such a cylinder would instantly roll to the bottom.

But let us suppose a weight, P, joined by an arm to the central axis and fixed upon it; this counterpoise if sufficiently heavy and placed behind the central perpendicular, would cause the cylinder to roll back or up the incline to the point where its equilibrium should be established—say in a position shown in the sketch. Without a train and an escapement the cylinder would remain thus immovably fixed upon the plane, but the weight, P, combined with the gravitating force of the cylinder, acts as motive power, and the center wheel, upon the axis of which is fixed the counter weight, turns at a rate governed by the escapement and the balance. The constant tendency of the weight is to fall, but it being impossible to destroy the equilibrium, the cylinder proceeds slowly down the incline as the retaining weight, P, is periodically released. Having finished its downward course, it suffices to place the cylinder again at the

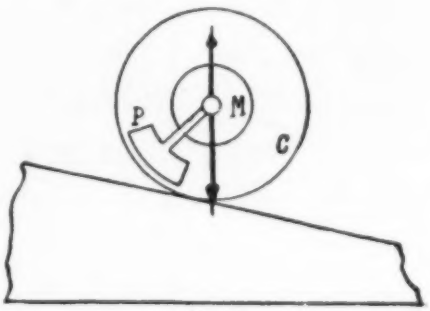


Fig. 2

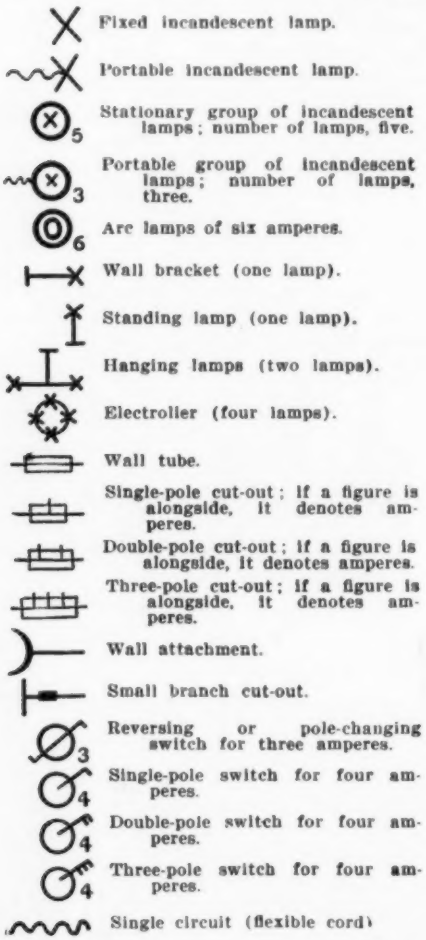
head of the plane upon the same hour as it marked when removed from below, to have it repeat the operation. We should not fail to remark that for a full 24-hour run our Fig. 1 is not properly divided on the plane; the numbers should begin with VI and end with VI.

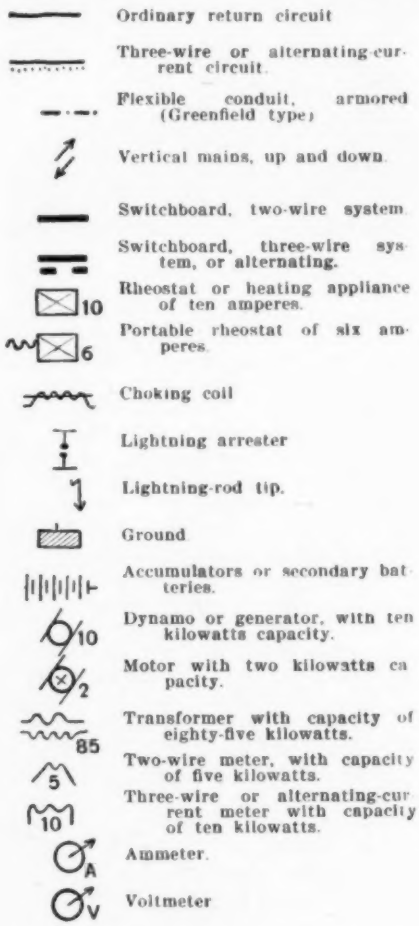
This curious clock has attracted a great deal of attention wherever displayed. Great crowds gather to watch it and wonder and try to figure out just how it works.

"The building material of the future will be beton, it is predicted," says United States Consul Kehl at Stettin, Germany. The Germans are making many experiments with beton and claim that it is least susceptible to fire of all building materials in use, is cheap and is very durable.

CONVENTIONAL SIGNS USED BY FOREIGN ELECTRICAL DRAFTSMEN.

Blueprints and drawings laid out by German, Austrian and Italian engineers and draftsmen in their designs for wiring of buildings, etc., are generally most elaborate. Every little detail is shown in a most painstaking manner, and the signs here illustrated are universally used in the countries mentioned, to designate the material or apparatus to be used for proposed plants, says Arthur D'Romtra in the Western Electrician.


Fixed incandescent lamp.
Portable incandescent lamp.
Stationary group of incandescent lamps; number of lamps, five.
Portable group of incandescent lamps; number of lamps, three.
Arc lamps of six amperes.
Wall bracket (one lamp).
Standing lamp (one lamp).
Hanging lamps (two lamps).
Electrolier (four lamps).
Wall tube.
Single-pole cut-out; if a figure is alongside, it denotes amperes.
Double-pole cut-out; if a figure is alongside, it denotes amperes.
Three-pole cut-out; if a figure is alongside, it denotes amperes.
Wall attachment.
Small branch cut-out.
Reversing or pole-changing switch for three amperes.
Single-pole switch for four amperes.
Double-pole switch for four amperes.
Three-pole switch for four amperes.
Single circuit (flexible cord)


Ordinary return circuit
Three-wire or alternating-current circuit.
Flexible conduit, armored (Greenfield type)
Vertical mains, up and down.
Switchboard, two-wire system.
Switchboard, three-wire system, or alternating.
Rheostat or heating appliance of ten amperes.
Portable rheostat of six amperes.
Choking coil
Lightning arrester
Lightning-rod tip.
Ground
Accumulators or secondary batteries.
Dynamo or generator, with ten kilowatts capacity.
Motor with two kilowatts capacity.
Transformer with capacity of eighty-five kilowatts.
Two-wire meter, with capacity of five kilowatts.
Three-wire or alternating-current meter with capacity of ten kilowatts.
Ammeter.
Voltmeter

Conductors: B., bare copper; B. E., bare iron galvanized; G., seamless rubber insulation; L., flexible cords; K. B., bare lead-covered cable; K. A. lead-covered cable with asphaltum-taped cover; K. E. lead-covered cable, armored; g., conductors on insulators; o., conductors in iron conduit.

Firms making out plans and drawings to be used in the before-mentioned countries will do well to consider these symbols, and also carefully to add in figures the proposed amperes to be carried on each wire or cable.

One readily gets accustomed to them, and I find that in estimating for foreign work, the use of foreign prints with these symbols greatly accelerates the capabilities of the estimate department. The following conventional symbols are used in the three above-named countries:

Dr. Niels R. Finsen, whose experiments covering many years sucessfully demonstrated the use of chemical rays as a curative agent, died in Copenhagen, September 24. His "Finsen's Medical Light Institute" gained world-wide renown in curing tuberculosis of the skin.

PLOWED WITH AN AUTOMOBILE.

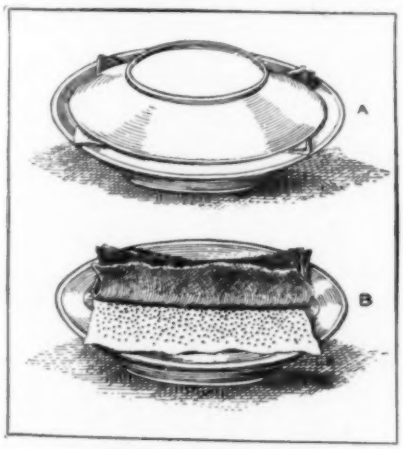
The automobile is put to many uses and abuses. Not long ago a Chicago physician used one to disperse a gang of hold-up men and now an eastern farmer has hitched one to a plow and is attempting to plow his fields with it.

The farmer first tried the combination in an effort to check a fire in a field of stubble and it was such a success that he began experimenting further. He found that the machine went too fast for the man at the plow handles to keep up with it. As another test the auto was attached to a mowing machine and a piece of ground which would have taken three hours to mow by horsepower was mowed in an hour with an automobile.

A SIMPLE HOME-MADE SEED TESTER.

A very satisfactory and yet simple seed tester for determining the per cent of seed which will grow can be made by any one. Mix the seed thoroughly and count out a hundred or so of the seeds, not making a selection but taking them as they come, says the Grain Dealers' Journal.

Put them between a fold of cotton flannel and do not allow them to touch one another. Place the cloth on a plate, moisten it well but do not saturate it. Cover it with another plate and keep at a temperature of



A Home-Made Seed Tester
A, Closed B, Open

about 70 degrees F. Take out the sprouted seeds every day, counting them. The good seeds will all have sprouted inside six days. The percentage that will grow can be determined from the total number sprouted.

HOW TO KEEP BICYCLE TIRES FROM CREEPING.

To keep a double-tube bicycle tire from slipping and pulling the valve stem it is only necessary to purchase a few common

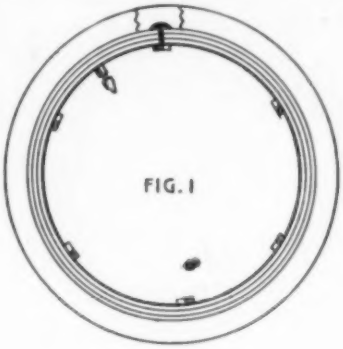


FIG. 2

FIG. 3

round head stove bolts (Fig. 2) just of proper length to reach through the inner edge of the casing and the rim of the wheel. Put the bolts in a vice and file to shape of Fig. 3. Care should be taken to make the heads as flat as possible and yet leave the edges perfectly round and smooth.

Take your wheel with the tire on and mark accurately the points on both rim and tire at which bolts are to be placed. Six bolts for a wheel of 36 spokes is plenty, while for 28 and 32 spokes the number of bolts would have to be changed to make the spaces between them of the same distance.

Drill holes in the rim, taking care to be exact, and also through the inner face of the tire. The inner tube should be removed while doing this, as it will be apt to get cut. The bolts can be let into the casing and worked around until they go through the holes with the head on the inside. Put the inner tube in place; lace up; apply cement and when the tire is put on and nuts tightened up it is on to stay. The bolts will not prevent the tire from being removed for repairing punctures.

One of our readers, Sern Madsen of Forest City, Ia., sends us this kink which he has himself tried and found wholly satisfactory.

HOW TOLL MESSAGES ARE TIMED.

The problem of timing long distance conversations at a big busy telephone exchange, where a great number of such conversations are held daily, might puzzle the novice who knows nothing of the accurate little apparatus which keeps tab on the minutes so exactly that it would be impossible to cheat the company.

This little instrument, known as the calculagraph, is a mechanical wonder. It prints the elapsed time without the least mental effort on the part of the operator further than to pull a lever at the beginning and the end of the conversation. "It mechanically subtracts the time of connection from the time of disconnection and prints the actual number of minutes and quarter minutes that elapse during the interval," says the American Telephone Journal, from which this description is condensed. A single calculagraph can be used for a large volume of business and two telephone operators seated at the same table usually have a calculagraph between them which they both use irrespective of the order in which the conversations come.

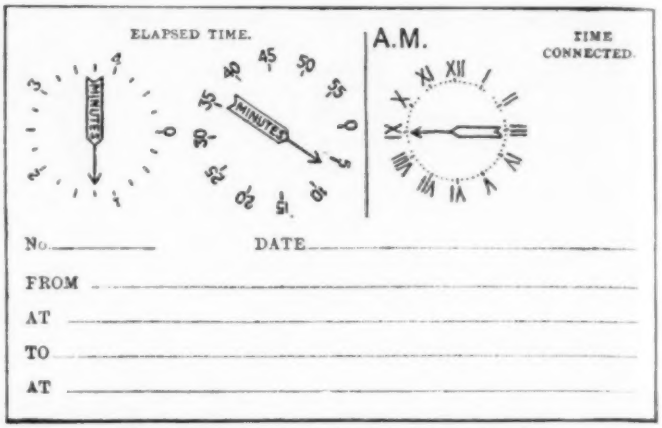


Fig. 1. Toll Ticket Showing Calculagraph Imprint

At Fig. 1 is shown a standard toll ticket bearing a calculagraph imprint which tells all that is required for the purpose. The right-hand dial shows the time of day the parties were connected for talking. A triangular pointer revolves around the outside of the dial to show the hour and the pointer within the dial indicates the minutes. In this instance it is 9:45 a. m. The other dials record the elapsed time in minutes and quarter minutes. The central dial or the one to the left of the line is one hour divided into 5-minute periods, while the left-hand dial on the card has a total of 5 minutes divided into quarter-minute periods. Thus, time spent in conversation is read on the two elapsed time dials.

The mechanism of the calculagraph is detailed in Fig. 2, which shows how the center elapsed time dial is printed. At the top of a shaft, b, is permanently mounted a pointer die, a, which revolves with the clock mechanism. A forward movement of the handle, L, forces the shaft up and if a card is inserted between the inking ribbon and the platen an impression of the arrow-shaped pointer will be printed on it. A dial die, with a sleeve-shaped stem, d, is also mounted on the pointer shaft, b, and revolves with it. A forward movement of the handle, R, forces the stem, d, upward without lifting the pointer shaft and that operation prints a dial like the central one in

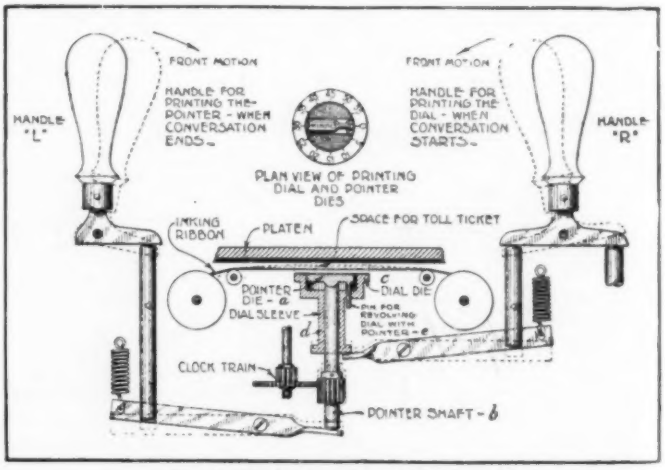

FRONT MOTION
HANDLE FOR PRINTING THE POINTER - WHEN CONVERSATION ENDS -
HANDLE "L"
FRONT MOTION
HANDLE FOR PRINTING THE DIAL - WHEN CONVERSATION STARTS -
HANDLE "R"
PLAN VIEW OF PRINTING DIAL AND POINTER DIES
INKING RIBBON
PLATEN
SPACE FOR TOLL TICKET
POINTER DIE - a
DIAL SLEEVE - d
DIAL DIE - c
PIN FOR REVOLVING DIAL WITH POINTER - e
CLOCK TRAIN
POINTER SHAFT - b

Fig. 2. Mechanism of the Calculagraph

Fig. 1, but without the pointer. To make the dial and the pointer revolve together a connecting pin, e, is used, so causing the arrow to always point to the zero mark on the dial. Either the dial die or the pointer die can be forced upward separately without causing the other to make an impression. In practice the dial is printed at the beginning of a conversation and the arrow at the end, both having moved forward during the interval so that the arrow when printed points toward the figures on the ticket which express the elapsed time.

To operate the calculagraph (Fig. 3) a ticket is inserted face down in the slot at the front of the instrument, with the top edge and the end of the ticket against the guide and stop. This is done at the beginning of the toll conversation. Then the right-hand lever, R, is pushed backward and again pulled forward, each time to the limit of the movement. The backward movement gives the imprint which tells the time of day the conversation began and the forward movement prints the two elapsed time dials, but without the arrows. The ticket is then immediately removed from the slot, so that the calculagraph is free to be used for other records if needed. When the party talking has finished, the card for his conversation is promptly inserted in the ticket slot just as before and this time the lever, L, is pulled forward and the movement prints on the card and within the elapsed time dials two arrow-shaped pointers, which point toward the figures and division marks which indicate the elapsed time in minutes and quarter minutes.

The printing mechanism of the calculagraph is so adjusted that it in nowise interferes with the regularity of the clock. The work is performed without noise or jar and does not interfere with the free operation of the switchboard.

The Union Iron Works at San Francisco are to be enlarged and made the finest in the United States, if not in the world. The improvements in the works are already under way.

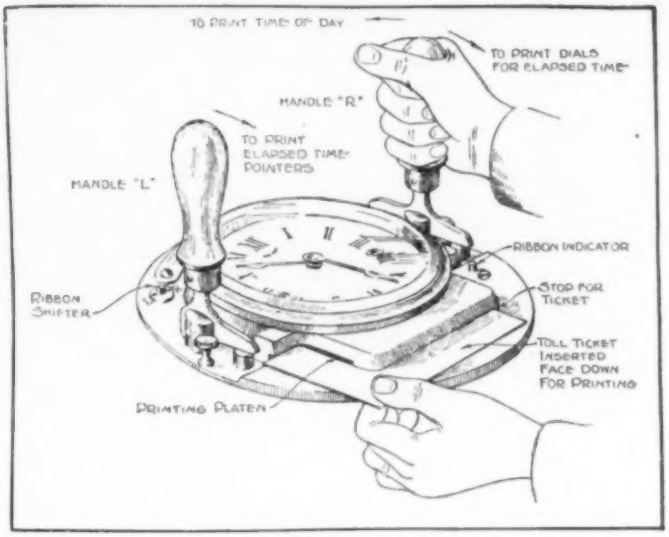
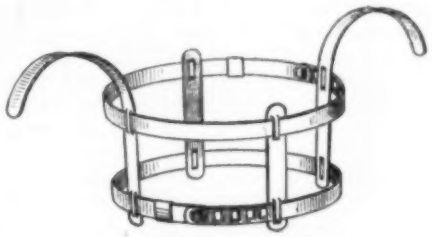


Fig. 3. Operating the Calculagraph

HOLDS MILK PAIL WHILE MILKING.

A New Jersey man who grew tired of holding the milk pail between his knees while milking has patented the device shown in the illustration. The pail fits into the frame nicely and the curved arms fit over the milker's legs above the knees, thus



For Holding the Milk Pail

supporting the weight of the pail. The circular frame is adjustable to any size pail and the contrivance can be arranged to tilt the pail at any angle desired.

AMERICANS USE PLENTY OF SALT.

The production of salt in the United States for 1903 was 18,968,089 barrels (of 280 pounds), valued at $5,286,988. The domestic consumption was greater than the production, as it usually is, being 20,062,587 barrels. The United States ranks second in the production of salt, Great Britain being a little in the lead.

DETACHABLE CYCLE MOTOR.

May Mean the Solution of Individual Rapid Transit

An English manufacturer has put on the market a detachable motor for bicycles. The motor is supported at one end by the bicycle—which may be of any make—and at the other by a single trailer wheel. The power is a small gasoline engine. The advantages of the arrangement are evident. First of all, the man who already has a wheel need buy only the motor part; the weight is carried so low that the outfit is not top heavy, as with present types of motorcycles, and there is very much less vibration and jar as the machinery is carried on the rear wheels.

The flow of gasoline and the usual control of the motor is entirely at the rider's command, being regulated by levers at the handle bar.

The cost is not at all excessive, the price of the attachment complete being only $75 to $80. One of these machines has already covered over 3,000 miles without repairs or apparent deterioration. The motor drives by a chain to the hub of the rear large wheel, and weighs 60 pounds. The total weight of wheel and motor attachment is thus under 100 pounds, an amount which permits of easy handling. The Model Engineer, London, says there is a patent in England on the attachment but none on the engine as any suitable motor may be used. The machine makes as high speed as any motor cycle, is a good hill climber and operates with engines of from 1¼-horsepower up.

The attachment wheel facilitates rather than retards the steering, and inasmuch as no extra strain except that of speed is imposed, present type bicycle frames are found to be amply strong. The supply of gasoline carried on the wheel illustrated is sufficient for 100 miles. The only alteration in the bicycle to be used is a new hub for the driving wheel, and this is easily applied.

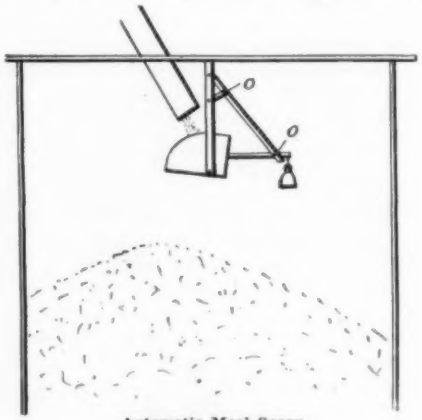
Does this mean the solution of individual rapid transit by mechanical means for which hundreds of thousands in our large cities have been waiting so long? If the machine when it first appears can be sold for $75 is it not reasonable to expect that by producing in enormous quantities they can be made and sold at a fair profit for $50? Sewing machines dropped from $150 to $25; bicycles did the same. Any device which is capable of an universal sale warrants large plants equipping to produce in large quantities.

While there will doubtless be many improvements the idea seems a good one and to possess staying qualities. The uses to which the machine can be put includes all that are now served by the bicycle and many times more. Every doctor could use one for emergency work, for he could cover several miles with such a vehicle while his horse was being put in harness. Police and fire departments, and workmen engaged in emergency repairs of all kinds would find it usable for large numbers of men. Workmen of all kinds, clerks, professional men who need the fresh air, which a daily trip in good weather affords would swell the army of users. In addition the reduced price would appeal to thousands of pleasure riders.

AUTOMATIC MEAL SCOOP.

A correspondent in the American Miller says:

For years we were troubled by the fact that our unbolted meal, when spouted into the bin in a steady stream, would separate, and require mixing to keep it even quality and weight. To correct this difficulty we contrived the "wrinkle" here sketched, and with the result that no matter how fast or how slow we grind, or how full the bin gets, our unbolted meal is always even. The contrivance is easily made, and costs but a trifle.



Automatic Meal Scoop

The weight arm has a sweep of the distance between points marked "O." Make scoop about 6 inches wide and 9 inches long by 6 inches deep. Hang so that stream strikes at center of top of scoop. Place bar across frame at points "O" to support and retard weight arm. Adjust weight so as to properly return scoop when empty and hold same in position till full.

SEEING BY WIRE.

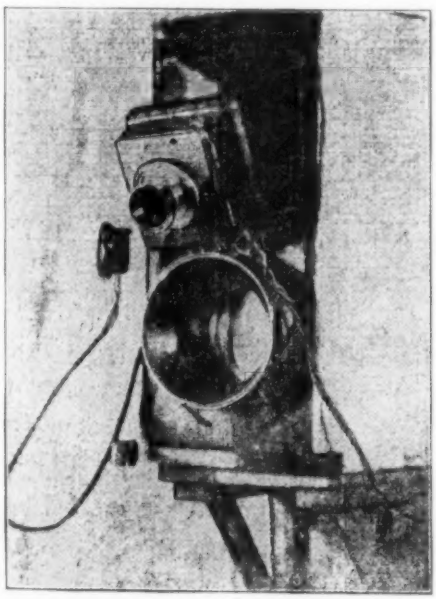
Two Senses Combined in the Telephone—See Over Miles of Intervening Space

Seeing over the telephone! Looking into the face of the other fellow, miles away perhaps, and yet noting very fleeting change of expression. This is the invention which, unheralded, hardly to be credited, has startled the world more than did the transmission of sound over miles of wires. In transmitting sound the delicate little disk in the mouthpiece of the telephone passes the sound waves created by the spoken word along the electrified wire to the disk of the receiver at the other end of the line where they repeat their message into the intent ear. But in seeing over the 'phone much more is involved. It is not the unchanging look caught and recorded by the camera; it is the active, intelligent semblance of life, of color, of action, substance and form, multitudinous combinations of waves of light and the transmission of these over miles of wires is what is involved in seeing by telephone. And yet the device that can perform this wonder has actually been invented and even now is carefully guarded from the peering, eager eyes of a curious and unscrupulous world.

When J. B. Fowler of Portland, Oregon, the inventor of the device, was a young man he worked in a glass factory at Bellaire, Ohio, and every day he took a long list of

J. B. Fowler
(The man who made seeing by Telephone possible)

orders for the factory over the 'phone. One night after being so employed for several hours during the day he dreamed that he was giving a theater party to a number of friends in Bellaire, but that the play was being enacted in Wheeling, W. Va., four miles away, and was presented to the party over the 'phone by means of a combination of wires, lenses and disks, the scenes being thrown by a stereopticon on a canvas while the voices came over the 'phone. This improbable dream, this wild flight of slumber vision was the germ from which Mr. Fowler's invention grew—grew through long years, silently but persistently.



Telephone by Which One Can See the Speaker at the Other End of the Line

The wonderful telephone in the home of the inventor appears to be very little different in its main features from the ordinary telephone. It is merely a box nailed to the wall from which projects a mouthpiece and a lens. What the connection with this lens, how the waves of light are transmitted, no one knows: that is the inventor's secret; the only information he will give being that it is entirely independent of the 'phone. In demonstrating, his daughter went to one end of the line two rooms away and on looking through the lens her face in color, contour and expression was plainly visible. As she spoke the motions of her lips were apparent and she drew various cards from a pack and held them before the lens and each one could be distinguished at the other end of the line.

Mr. Fowler expects to perfect his invention before giving it to the world. In his

own words he hopes to do wonderful things with it. He says:

"I am certain that it can be attached to the telephones of the city so that the people will be able to see the person with whom they are conversing. In time I hope to be able to so arrange it and enlarge its scope that a patron can sit at his desk or in his home and see a baseball game, a prize fight or a play at the theater with perfect ease and accuracy. I expect that it can be so perfected that the train dispatcher can sit at his desk and watch his trains swing into the different stations along the road and depart. In fact, the scope of its usefulness is unlimited, and I am confident of success. I have the principle, and time and study will improve it until it will be a thing as marvelous to the minds of the present generation as was the first telephone to the generation of yesterday."

PRICE OF RUBBER ADVANCING.

Crude rubber now costs $1.20 a pound in New York, the principal receiving port for this much used commodity. Thus far no satisfactory substitute has been discovered for rubber, and the demand is steadily exceeding the supply. The cultivated rubber trees in American and native plantations in Mexico have not yet come into bearing to an extent to relieve the stringency. In fact they are not likely to do so for years to come on account of the new inventions coming out which must use rubber, and to the increasing manufacture of articles which cannot be made of any other material.

There are not hundreds, but thousands of articles in which no substitute for rubber has yet been found and for which no substitute is likely. Electrical manufacture makes heavy demands; makers of overshoes and rain coats use hundreds of tons; automobile tires have been the latest largest addition to the demand, while the multitude of small things from a rubber band to garden hose combine to produce requirements that are already enormous and constantly increasing.

A rubber plantation costs money and several years to come into production, but when once it does begin to yield returns they are large and very profitable. It has apparently been left to Americans to grasp the necessities and possibilities of the situation and they are going at the matter in the broad-guage manner that is characteristic of their operations. The chief regret is that they cannot make the trees grow within their own borders.

The production of rubber from the Amazon River district for the past year and exported was: To Europe, 34,061,482 pounds; to the United States, 33,253,109 pounds. The total increase exported over the previous year was only 1,558,543 pounds.

TRIMMING ARC LAMPS BY AUTOMOBILE.

The position of lamp trimmer for a big lighting company in Philadelphia is one of comparative pleasure these days. Instead of making his rounds on foot carrying a ladder on one shoulder and a leather bag of

Trimming Arc Lamps by Automobile

carbons from the other, he now has his chauffeur and rides in state.

The Western Electrician says: The platform, when extended to its full height, is 19 feet above the roadway, and it collapses to 14 feet. By means of this conveyance all the lamps on the bridge, which number 128, can be attended to in half a day, which means a saving of 50 per cent in time and labor.

SHOP NOTES

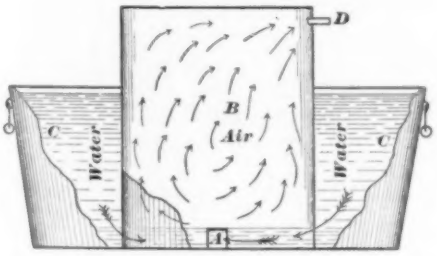
A BOILER GOING INTO DISUSE.

A boiler when about to be laid up for a season should be thoroughly cleaned on the inside, filled with water with steam on so as to be full of hot water that has been boiled, up to the safety valve. The flues and fire surface of the boiler should then be cleaned and ashes and soot removed from every part where such have lodged. Then close fire doors and ash pit, and put a cap on the smokestack. With this treatment laid-up boilers do not rust inside or outside. It is the moist air drawn through a laid-up boiler that does damage by rust.

IMPROVISED AIR COMPRESSOR.

Having been working fifteen miles from a railroad station in Alabama, putting in water pipes in a house, one day my blowpipe attachment to the firepot broke. After finding that I could not mend it, I constructed the "air compressor" shown in the accompanying illustration.

Securing an old lard can (designated B in the drawing), I cut the hole "A" in the side of it where the lid was formerly placed. Next I punched a hole into the side down near the bottom and inserted the tube "D." Then I got a wash tub "C" and filled it nearly to the rim with water, and taking the lard



Emergency Air Compressor

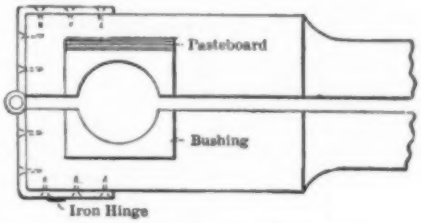
can and putting it upside down into the water and pressing it downward, the air came out of the tube "D," being forced up by the water pressure which entered the can at the inlet "A." I then attached a ⅜-inch rubber tube to the outlet "D" and the other end of the tube to the firepot, and I had an excellent pressure.

THE PLUMBER.

A CONVENIENT POLISHING CLAMP.

A polishing clamp which would be hard to improve upon in point of convenient features was contrived by a correspondent of the American Machinist.

The jaws or levers of the clamp are cut out so that a square block of standard size fits in snugly. Instead of boring a hole in the levers which would fit but one



A Polishing Clamp Improved

size of shaft, the hole is bored in the square block, and other blocks having other sized holes may be fitted in as required. In this way if a hole becomes so worn as to be unfit for further use the block may be discarded and a new one provided, or pieces of cardboard may be packed in between the bushing and the lever until the levers are held as far apart as they were in the first place, whereas without the blocks the whole clamp would have to be discarded.

Another good feature of this clamp is the manner in which the levers are joined. Instead of a strip of leather tacked to the wood, an ordinary iron hinge is used, the ends of which are bent to conform to the shape of the lever ends.

SOLDER FOR SEALING CANNED GOODS.

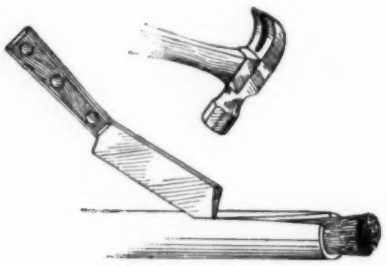
A good solder for sealing the tops of canned goods is made as follows: Melt 1¼ pounds of lead, add 2 pounds of tin, and then stir in thoroughly 2 ounces of bismuth. This makes a soft solder, and a very little heat will open the cans when desired.

TINNING BRASS AND COPPER.

Boil the article to be tinned with tin filings and caustic alkali or cream of tartar. The tinning will be perfect.

CABLE-SHEATH-CUTTING KNIFE.

A new invention on the market, which is filling a long-felt want with telephone men and all those who have to do with the laying of cables, is a knife for cutting cable



Knife for Cutting Cable Sheath

sheaths. The knife is very simple to operate and does the work quickly and neatly. The illustration explains its use fully.

ISAAC BABBITT DID NOT INVENT BABBITT METAL.

The soft alloy called Babbitt metal was not invented by Isaac Babbitt, as many infer. Instead Mr. Babbitt only invented the method of using the alloy in journal boxes, with which method the alloy became so closely associated that it naturally came to pass that it was called Babbitt metal. The metal he recommended was britannia metal, pewter, or an alloy of tin 50 parts, antimony 5 parts, and copper 1 part, an alloy somewhat softer than that now known as Babbitt metal, which is composed of tin 96 parts, antimony 8 parts, and copper 4 parts. The idea of using it was much the same, however—that is, to make a bearing which would conform to the surface of the axle.

Isaac Babbitt was born in Taunton, Mass., July 26, 1779. He learned the goldsmith's trade, and in 1784 made the first britannia ware which was produced in this country. This enterprise was not successful, however. He moved to Boston, entered the employ of the South Boston Iron Works, and in 1839 produced his great invention, for which he was given a medal from the Massachusetts Charitable Mechanics' Association, while Congress granted him a reward of $20,000. The invention was patented in England in 1844, and in Russia in 1847. He spent some time in the production of metals, and then manufactured soap. His life had an unhappy ending, for he died insane at the McLean Asylum, Somerville, Mass., on May 26, 1862.

HOW TO CLEAN SPARK PLUGS.

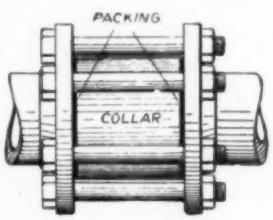
All that is required for the proper cleaning of spark plugs which have become sooted or carbonized are a toothbrush and some gasoline, says the Automobile. The spark points must not be rubbed too vigorously or they are apt to break off. If the plug is carbonized so badly that it is difficult to clean it with a brush, use a blunt knife which has a soft blade. A hard blade will tend to develop cracks by scratching the glazing on the porcelain, as will emery cloth also.

If a plug of suitable design cannot be obtained, and it is necessary to use one of a different design, be sure that the spark points do not project far enough to short-circuit the bottom of the plug recess or inlet valve In that case remove the plug and put on an extra gasket.

PIECING OUT A STEAM PIPE.

"After putting in new piping to an engine, it was found that one of the pieces had been cut 3 inches too short," says a correspondent of the Engineer, who tells how he got around the difficulty by piecing out the pipe.

An old cast-iron slip collar was taken from the scrap pile and the set screw holes



Showing Ring in Place

were plugged with patch bolts and the extra length sawed off. The slip collar was then put in the lathe and bored out to the size of the pipe, 5 inches, and it was then turned down until it would just fit inside the flange bolts, which gave a ring of metal a little over an inch thick. This was faced down to 2¾ inches, making room to put a rubber gasket between each end of the collar and pipe flanges. When drawn tight the joint was complete and though made some time ago has never given any trouble.

REMOVING STUBS OF BROKEN SET SCREWS.

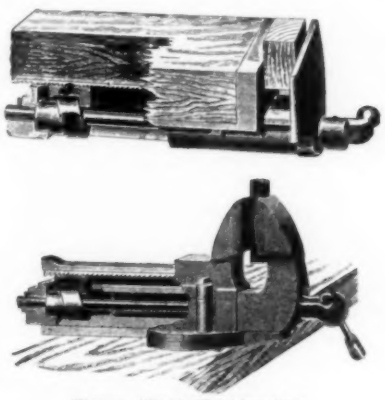
To remove set screws which have been broken or twisted off do not drill them out for that injures the thread and is apt to make it necessary to cut deeper where sometimes a larger screw cannot be used.

A good way, says a correspondent of the Blacksmith and Wheelwright, is to take a good piece of tool steel and make a strong drill bit to fit the drill. Make the drill bit left-handed so that it will turn backward and draw out the broken screw. First cut a notch in the screw with a chisel; then put in the drill and turn the drill backward, being careful to keep the drill in the notch. Nine out of ten can be taken out in this way if they are not too badly rusted.

LIGHTNING GRIP VISE.

If a mechanic could figure up all the time he has wasted in his life in needless tightening and releasing a vise, and reduce the number of hours to dollars and cents, the result would not fail to astonish him.

A recent invention enables the workman to set the vise by a single movement of the handle. Ten seconds is sufficient to make a perfect clamp on each of three pieces, say, 2 inches, 6 inches and 12 inches in



Upper—Wood-Working Vise
Lower—Vise for Iron Work

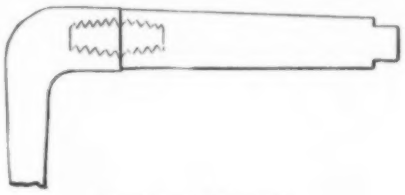
thickness. This shows the range of work. The same principle is applied to vises for holding iron work.

To prevent polished tools from rusting, dip them in boiled linseed oil and allow it to dry on them. Common sperm oil will prevent them from rusting for a short period.

HOW TO REPAIR A BROKEN AXLE IN AN EMERGENCY.

A broken axle which must be repaired immediately for use over a good stretch of road may be done in the following manner:

Take the two parts to the nearest blacksmith and have a half-inch hole drilled and



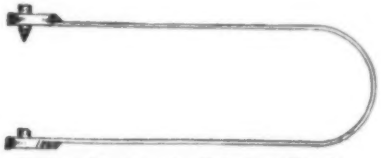
Repairing a Broken Axle

tapped in the center of each piece, then put a half-inch pin, threaded on each end in the two holes, screw together and braze securely.

A correspondent of the American Machinist used this method on an automobile axle which was broken square off next the shoulder for the cone. The auto made a 12-mile run and the repair was entirely satisfactory.

MARKING THE HOLE IN A SLIP LAY.

A very handy tool for marking the hole in the landside point of a slip lay can be made of flat spring steel, light enough to spring with the hand, says a correspondent of the American Blacksmith. The blunt plug should be ¾ inch and the sharp one should be hardened like a center punch. To



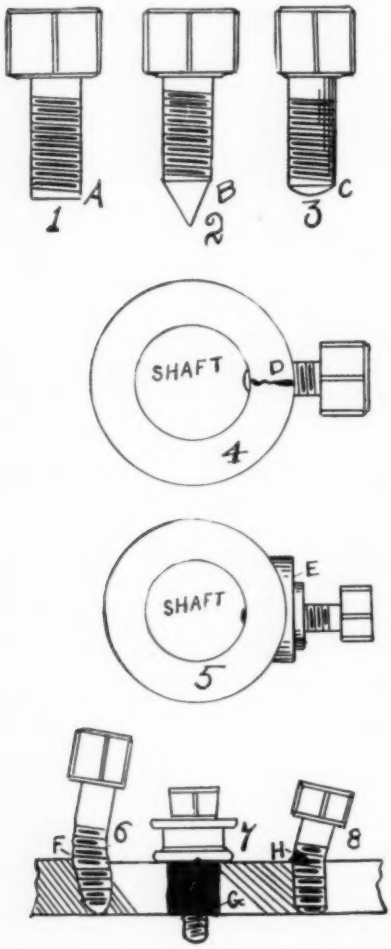
Tool for Marking the Hole in a Slip Lay.

use, hang up the plow by the clevis. Place lay in position and blunt plug in hole in the frog of plow. Spring together with left hand. Hit a tap with hammer on center punch and your lay is marked on the outside and in the right place.

An effective cooling compound for a hot bearing consists of 1 part white lead and 2 parts tallow, mixed with enough cylinder oil to allow it to be fed readily.

SHOP TALKS ON SET SCREWS.

The little problem of set screws as used in modern machinery and devices forms a project of considerable importance. The accompanying sketches will assist in bringing out the desired points. In Fig. 1 we show the "flat-pointed" set screw. This form of set screw may be found in general service very frequently. The trouble with this type



of set screw is that there is no opportunity for the end of the screw to secure a grip equal to that of the beveled point. The blunt or flat-pointed screw is brought to bear upon the surface of the part forming the shaft, wheel or coupling combination, and it may or it may not sustain the parts. I have met with cases in which the pressure of the flat end, A, on the interior shaft or other part served to hold the part firmly. Again I have found numerous indications of severe grooving, due to the point of the screw having been dragged around the shaft a number of times. To tighten the screw in the groove the screw is given additional turns from time to time. By and by quite a deep groove results, and the shaft will be ruined. Once the groove is established, the parts cannot be moved to right or left unless sufficient distance to prevent any liability of the set screw tip dropping over into the groove.

On the other hand, we have the extremely pointed set screw to deal with, as represented in Fig. 2. The point, B, is hardened, and as a rule quite sharp, so that a hole is soon "pricked." The point serves to afford an excellent gripping power. But when once the hole is formed in the shaft, adjusting is difficult, for the reason that the point of the set screw will work its way into the old hole. Therefore the set screw with the rounded end is usually employed. The oval end, C, can be brought upon the shaft with considerable pressure without actually indenting it.

Some builders of machinery make an excellent design of screw which is about midway between the round end and the pointed end.

The Expansive Set Screw.

One finds set screws in service under varying conditions when he makes a casual examination of machines and shafting in mills, shops and power-using plants. Fig. 4 is a sketch made by the writer of a condition found prevailing in a number of collars used in an electrical power plant. The visit was made through the works during the noon-hour stop. There were a number of collars used on either side of shaft journals for the purpose of retaining the alignment. The collars were not provided with shoulders for the strengthening of the same. Therefore, a number of the collars were fractured, as at D, Fig. 4. In some cases the defect had been overcome by the shrinking of a band of wrought iron about the collars. In other cases the collars were permitted to remain cracked. Fig. 5 is an illustration of one of the collars provided with the strengthening shoulder, as at E. I found that in some cases the fracture in the collars was due to the over pressure of the set screw point upon the shaft. In other instances the use of set screws possessing a tapering condition brought about the split. If the screw tapers, the deeper it is inserted the more liable the expansion is to crack

the collar, and these conditions prevailed in some of the broken collars.

The Lengthy Set Screw Is an Annoyance.

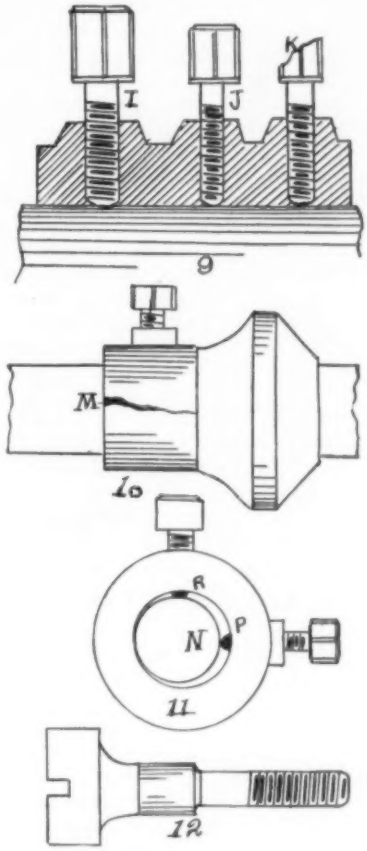
There is always considerable annoyance experienced when set screws are used which are too long. The set screw of unnecessary length in collars is liable to catch upon the clothing of workers and do damage. The long set screw is more likely to become bent than the short or properly adjusted screw. Fig. 6 is an illustration of the set screw of extreme proportions. Because of the projecting upper part, the screw often gets bent, as at F, and a new screw will have to be substituted.

In passing through a flour mill recently I saw that they had made up for the extreme length of some of the set screws in shaft collars and hubs of wheels by using washers as in Fig. 7. The washer system is a poor one. Often instead of washers there are some unusual parts employed to fill the space, as is shown. Sometimes when the thread work of the set screw is exhausted through wear and tear, the hole is bored out and a thimble, G, is substituted. This thimble is cut with the threads to correspond with the threads of the set screw. The thimble is brazed into the part where it belongs and becomes quite as strong as the original solid portion. Fractured portions of set screws, with the defective part at the edge of the bore, as at H, Fig. 8, are not uncommon. I located a number of instances in which the set screws had come into contact with some object and were partly bent over and turned off. When the set screw gets into this condition the only remedy consists in substituting a new one. In many cases the attempt to turn the set screw out will wreck the screw and snap off the head. Then it will be necessary to drill the stub out of the hole, or a cold chisel may be used to cut a slot, and then the stub can be turned out.

Diameters of Set Screws.

We next refer to the diameters of set screws as they were seen by your correspondent. In Fig. 9, at I, is shown the set screw of fair or medium diameter, as employed in usual cases. If one were to look through the shops and mills he would soon locate instances in which there were set screws in use of much greater diameter than needed. The over-weighted set screw is liable to bulge the part into which it has been inserted and fracture the metal. On the other hand, one sees very slender set screws in use at times, one of which we show at J. These styles of set screws are devoid of the substantial bodywork needed to make a firm screw. The happy medium is what the machinist seeks for.

The long, slender set screws are dangerous. They are likewise much bother. It is frequently difficult to keep the thread plan correct. In the same cut we show the broken or worn-headed set screw, and these may be found in some of our best shops. The monkey-wrench in the hands of the new man often causes defects of this nature. Sometimes the edge of the head is worn off.



The defective part is designated I, and the remedy is a new set screw.

Excessive Pressure and Results.

Many times split hubs of gears and wheels are cracked in power plants because of unnecessary pressure of the set screw. Fig. 10 explains the point in mind. The set screw is fitted into the shouldered portion of the hub. Perhaps the set screw point is adjusted into a depression in the shaft.

An unusual strain draws the part over and the point of the set screw rides the common level of the surface shaft. The result is that the set screw is forced outward, often to the degree of opening the hub, as at M. This is fixed in some cases by the use of metal bands about the fracture.

Alignments by Means of Set Screw Points.

It is not out of the ordinary to find samples of crude work with set screws as represented in Fig. 11. I have often met with examples of setting with set screws like this, in which the shaft is of too small diameter for the collar or hub. The workman tries to overcome the trouble by adjusting inward on the set screws. The chances are that the shaft, N, will be thrown quite far out of line, unless there are an equal number of set screws. In the case shown the set screws are two in number and so set that the points, R and P, force the shaft off from the center of the bore. Sometimes the shaft is held in the center by using strips of metal as keys on the side opposite the set screws.

This is a slip-shod way of doing work. A better way is to insert a sleeve. The only proper way is to remodel the parts and adjust them only when the collar fits snugly to the shaft. Fig. 12 is a set screw arranged for turning with the screw-driver blade and monkey-wrench as well. It is seldom possible to get a good grip with the screw-driver. Still there are numerous set screws employed which are manipulated entirely by the screw-driver. "TRAVELER."

HOW TO WEIGH IRREGULAR CASTINGS.

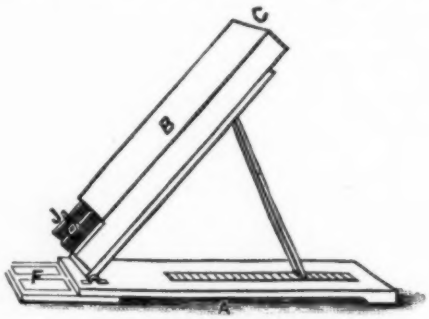
Irregular shaped anchor patterns can be made the right size so that the castings will be of the weight desired after the method shown in the illustration. Of course many know that a cubic inch of iron weighs .26 pounds, says the Pattern Maker, and if the volume of any piece is known the rest of the matter is easy. But irregular shapes are often difficult to figure. Immerse the pattern in water until the pail is just full, then remove it and measure the depth of the water below the top of the pail. Multiplying this distance by the area of the pail gives the volume of water displaced. It is obvious that the volume of the water displaced is equal to the volume of the pattern. This method is applicable to any irregular patterns. Where there are cores which are symmetrical it is easy to figure their volumes and deduct them from the volume of the water displaced.

TELEPHONED FROM A RAFT IN A WATER TOWER.

The inside of a large standpipe belonging to the water company at Paducah, Ky., was painted recently, the painters doing their work from a raft which floated upon the water within the pipe. In all previous times staging had been used within the pipe, but this time the staging was done away with, and telephonic connection was established between the men in the pipe and the engineer in the pump room. When the men had painted as high as they could, they signaled the engineer, who raised the level of the water in the pipe to the required height, and the men proceeded with the work.

THE TINTOMETER.

The tintometer, devised by J. W. Lovibond, of Salisbury, England, is an instrument by means of which the color of any



The Tintometer

object, liquid or solid, opaque, translucent or transparent, can be measured and analyzed in such a way as to permit the keeping of a simple and easily understood record; and for facilitating the establishment of color standards and promoting adherence to them.

A set of standardized colored glasses is used in making the tests. The standard glass is placed at J, and the object tested at F. The observer looks into the box (B) at C.

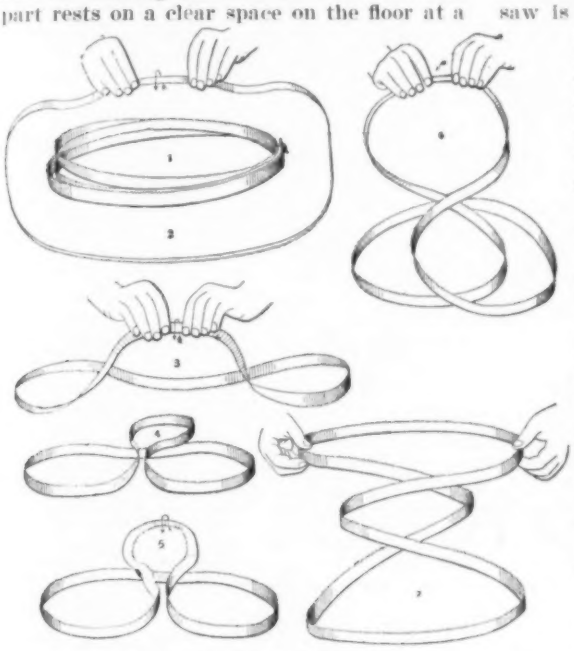
HACK-SAW WRINKLE.

The following is a very expeditious method to obtain a wide slot in a minimum of time: Instead of using one saw blade in the frame, simply add more blades, according to the width of the slot required. This will be found to save much tedious labor of filing.

HOW TO FOLD A BAND SAW.

The proper method of folding a band saw is not easy to discover without help, but by means of a practical demonstration is very quickly learned, says a correspondent of the American Machinist, who proceeds to explain just how it should be done, as follows:

Fig. 1 shows a saw which has been folded as required. Fig. 2 shows the beginning of the operation with the saw open and in position for making the first twist. The lower part rests on a clear space on the floor at a convenient distance in front of the operator, who stands holding the upper part as shown by the hands. It will be noticed in Fig. 1 that there are three folds, and that of course they cannot lie level all around as a broken saw can be rolled. In Fig. 2 the saw is twisted in the direction of the arrow, and it will be noticed in all the views that the twist is always in the same direction. Supposing the saw to be held with the teeth away from the operator, the first twist turns the part in the vicinity of the hands with the teeth toward him. If the entire saw is allowed to spring freely while twisted in this way, this has the effect of throwing the lower part of the saw into two loops, as shown in Fig. 3, although Fig. 3 really goes a step beyond this stage and shows the next twist commencing. Fig. 4 shows that the effect of the first twist can be very simply obtained by merely laying the saw on the floor and drawing one part over the other; but nevertheless in folding a saw it is easier to obtain this effect by a twist, as in Figs. 2 and 3. Fig. 5 shows how the saw is to be twisted after it has assumed the Fig. 4 position. This final twist when completed allows the saw to fall easily into three coils. The first two loops form two coils which turn one over the other when the third is formed. The third coil is formed as soon as the remaining part of the saw is twisted completely over. The rings then will adjust themselves and will not open again unless untwisted. Untwisting can very easily be done by anyone, although it is seldom that a person can discover by carefully opening a saw how to fold it again.



Folding a Band Saw

Fig. 6 shows the operation practically completed. The two lower loops are overlapping each other with their teeth uppermost, and the upper loop still has its teeth toward the operator and merely requires to have them turned upward and the loop allowed to fall and adjust itself with the other two. Fig. 7 shows the saw completely folded, but with its coils raised vertically to show how they lie.

Saws in use can be handled and stored much more conveniently when folded in this way than if they are kept at their full diameter. A broken saw can easily be rolled up and tied by anyone, but an endless saw cannot be rolled, and there are many workmen who only know how to manage a broken one.

POLISH FOR HARDWOOD FLOORS.

A fine wax polish for hardwood floors may be made as follows: One-fourth pound of potash mixed with equal weight of water, boil and add gradually, stirring all the while, one-half pound of yellow bees-wax. Boil up, then pour in one pint of water and heat till it looks milky. Apply at once.

To find the thickness of lead pipe required when the head of water is given, multiply the head in feet by size of pipe wanted, expressed decimally, and divide by 750. The quotient will give thickness required in hundredths of an inch.

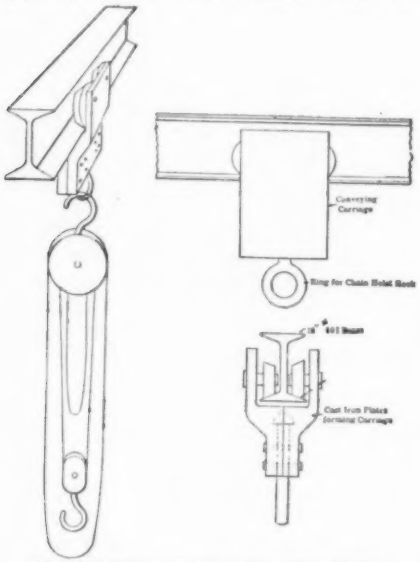
AN EXCELLENT VARNISH FOR IRON WORK.

Dissolve ½ pound of asphaltum and ½ pound of pounded resin in 2 pounds of tar oil. Mix hot in an iron kettle, but do not allow it to come in contact with the fire. It may be used as soon as cold, and is good both for outdoor woodwork and ironwork.

HOW TO MAKE A TRAVELING CRANE.

An inexpensive and very satisfactory traveling crane for the plant where there is a great deal of heavy lifting in connection with repair work, etc., may be made at home, says the Street Railway Review.

Make of 8x10-inch pine timbers two A-frames to fit singly into an extra heavy 12-inch I-beam. (See sketch). Pass bolts through both timbers above and below the I-beam and fasten substantial cross pieces diagonally across the two legs. Notch out a



Details of a Home-Made Traveling Crane.

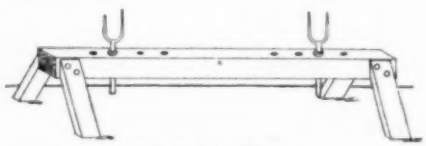
heavy timber near each end to keep the legs from spreading and run bolts through the ends of the bottom beam to prevent shearing of the end pieces. Make a carriage of four wheels with faces beveled off to fit the flange of the I-beam, which will distribute the weight carried over the face of the flanges. The hook is below the I-beam and has two stiff cast-iron plates running up to carry the pins in which the wheels revolve.

Fasten a heavy chain block into the hook and the arrangement, which will pick up any ordinary weight, is complete and by means of it a piece of apparatus can be picked up and moved from 15 to 18 feet along the length of the I-beam in a very short time.

Four men can set up such a crane in a half day and when it is not in use it can be taken apart and stored. Its cost would be approximately $150; a 20-foot, 12-inch I-beam, weighing 40 pounds per foot costing $24; carriage can be built at machine shop for $30 and a 5-ton hoist of 12 feet lift would cost about $85.

A HANDY TRESTLE FOR THE REPAIR SHOP.

A handy device to keep a buggy tongue or shafts from slipping off the trestle while ironing or repairing is described by a correspondent of the American Blacksmith. A number of holes are bored in the trestle to receive a Y-shaped iron piece made with a ⅝-inch stem and ½-inch branches and having a collar welded to the stem 2 inches from the crotch. The device is so simple and saves so much annoyance that it is well worth the making.



Trestle for Repair Shop.

TEMPERING SPRINGS.

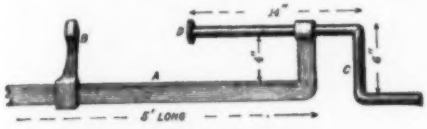
Fish or bank oil bites best in tempering springs. It gives sharper temper than black oil or cotton-seed oil. When using fish oil springs will stand up better if a shade less heat is used for tempering, than when using black oil.

A HANDY CLAMP FOR ANY PURPOSE.

A handy clamp for clamping wagon-box bottoms, doors and, in short, can be used for any purpose where clamping is to be done and can be made any length, says a correspondent of the Blacksmith and Wheelwright, is made as follows:

A is a bar of iron, 1½x1½ inches by 5 feet long, and eye turned and welded at one end. Four inches from the eye the bar is turned at right angles, edgewise. B is made of ⅜x1½-inch iron, and made to slide and stop anywhere on A. C is a crank of ¾-inch rod iron, 6 inches crank and 14 inches straight.

The straight part is threaded and works in the eye of A, which is also threaded. D is a washer that is fitted on C by a shoulder being filed for the washer to work against.



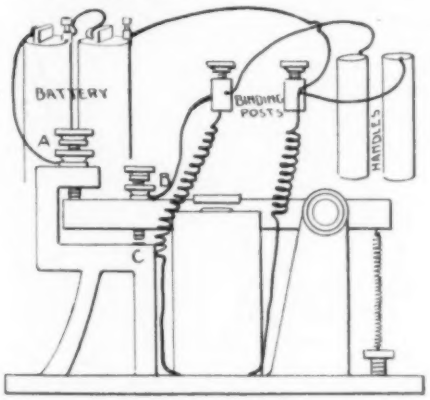
A Handy Clamp

The end of the rod is riveted so as to hold the washer, D. No notches are needed in the bar A to hold B; it will not slip when weight comes upon it, but will hold the firmer.

HOW TO MAKE A SHOCKING MACHINE.

A good shocking machine may be made out of a telegraph instrument as follows:

Fasten one of the battery wires on one of the binding posts of the instrument and fasten the other wire on the regulating screw, A; connect B with the other binding post. To prevent contact when the armature is pulled down put a piece of paper or thin rubber under the regulating screw, B, at C. The armature acts as a contact breaker as on the induction coil. In order to feel the shock, fasten two handles on the binding posts. The shock is regulated by the regulating screw, A.



Shocking Machine

Wm. J. Slattery, of Emsworth, Pa., who sends in this shop note, says an instrument of this kind will give a stronger shock than many high-priced medical coils.

Our readers are invited to contribute to this department. We can use rough pencil sketches; our artist will fix them up properly, and the editors will do the rest.

THE BLACKSMITH AND POWER-DRIVEN MACHINERY.

How to Measure the Difference in Expended Energy in Operating Hand Tools and Power-Driven Machinery

Nowadays there are two classes of blacksmiths, each having a distinct and widely different motive in its calling. We do not speak of the blacksmith who uses power-driven machinery and the blacksmith who does not, though truly a distinction could be drawn there by naming the one as out-of-date and the other as modern. But here the

Fig. 1. How Much Can You Lift?

classes referred to are composed of the time-honored smith, fabled in song and story as honest and brawny, who blacksmiths to earn his daily bread, and that growing class of men of many crafts and professions who have taken up blacksmithing from pure love of the work and of mechanics in general. The smith of this class may be honest or not as it happens and his muscles may be as flabby as an infant's, but according to tradition the strenuous recreation should rectify any fault in either direction, and surely for developing the strength no young man could choose a better form of athletics: foot-ball, tennis, rowing, hunting, none of the popular sports are to be compared to it. Until the end of time there will be something sociable and alluring about the blazing forge and the clanging hammers.

Blacksmiths who come within this latter class and who are usually amateurs should by all means learn to handle the hand tools

well in order to carry out their purpose and should install power-driven machinery only after the hand tools can be managed perfectly. Many power-driven machines, however, are to be found in the little backyard shops where amateurs practice the craft at night after a long day in the office and in the shop where the farmer-smith likes to do his own repairing. But the blacksmith who depends upon this work for bread and goes

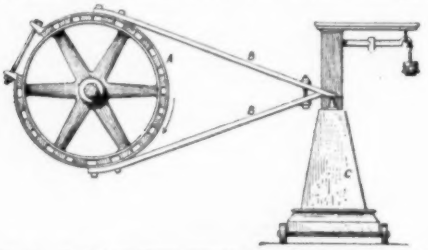


Fig. 2. Brake or Dynamometer for Weighing Friction

on day after day depending only on the results of hand tools when by means of power-driven machinery he might accomplish many times the results is very much like the man who hid his talent and from whom all was taken away.

In either case the following tests given by the Blacksmith and Wheelwright will be interesting. To the amateur because they will give him a fair idea of what he can do and to the behind-the-times smith in that they will demonstrate how much is to be gained by the use of power.

Fig. 1 is an apparatus composed of a small portable scale. The top frame is secured by rods imbedded in the sides of the scale. By means of this scale a smith can easily ascertain how much he can lift. To do this he crouches on the platform with his back against the frame and his arms resting upon a block. Supposing that the hand block and the frame together weigh 15 pounds and that the blacksmith's weight is 175 pounds the scale arm will indicate 190 pounds. By the smith's pressing upward against the frame with his back the number of pounds indicated is increased and this increase is the weight he can lift. The experiment may be carried further by setting a number of pounds to be lifted in a given time and practicing until the object is accomplished. Were the smith to keep up this test for two hours at a time, at the end of that period he would find that his weight had decreased several pounds. This difference in weight is the actual measurement of the energy he expends in that amount of work and measurements made in this way give some startling figures. Surplus energy is foolishly expended by the man who could utilize machinery driven by a gas engine or other power to do much more work in a shorter time with

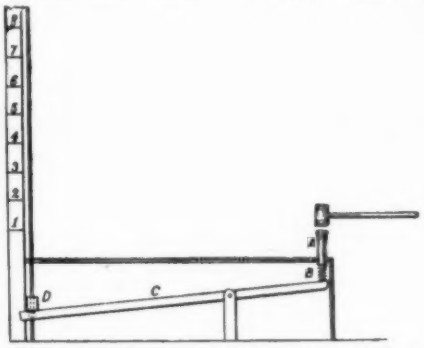


Fig. 3. Striking Box for Testing Force of Blow

a much smaller expenditure of energy, and at the end of the day he would be able to go home in a less irritable frame of mind.

In Fig. 2, is shown a brake or dynamometer for weighing the friction of work done by hand or by machinery. It consists of a metal band, A, clamped around the pulley of a machine by means of a bolt and nut.

Fig. 4. The Force of the Blow Depends on How the Sledge is Grasped

Between the band and the pulley are placed wooden blocks. Arms, B, B, are fastened to the metal band at one end and bolted together near the other end which rests upon a scale block, C, and depresses it, thus weighing the friction. By multiplying the scale weight so found by the circumference in feet of a circle having a radius equal to the length of B and then by the number of revolutions made by the pulleys the

foot-pounds of work can be computed. Attach such a brake to a grindstone with the helper turning the crank and weigh the friction. Compare the results.

Fig. 3 is an excellent device for testing the force of a blow. A scale is marked off to show the height to which the dummy, D, is forced by a blow. The stake, A, is struck with a sledge, the blow depresses the spring, B, which operates the lever, C, by which the dummy is forced toward the top of the rack.

The force of a blow from a sledge or hammer (Fig. 4) depends upon the way the handle is grasped and how it is swung and also upon the weight of the hammer, the squareness of the blow, the strength of the helper, etc., and these little points are important to both the amateur and the experienced smith, but for the latter it is false economy to go on using the sledge which requires the hiring of a helper and is slow and in the outcome expensive. A trip-hammer should be installed in every blacksmith shop. It does the work rapidly, pounds regularly, incessantly and hard, and a single helper can handle a large amount of work on it while an increase in earnings will soon become apparent. The power required to operate steam hammers is about one horsepower for every 100 pounds of falling weight. They are rated by the weight of die, ram, rod and pistons. Trip-hammers are rated by the weight of the head, as: 25-pound head, 75-pound head.

Tests of the power of a team of horses as pitted against the number of horsepower of an engine are very interesting. The unit of power, or 33,000 foot-pounds per minute is usually greater than good draught horses can do. By means of a dynamometer the exact power of a team of horses may be measured. The dynamometer, (Fig. 5) comprises a spring, A A, with a needle, B, and a graduated scale, C. D is a strip of paper ruled to correspond with the scale and is caused to move under the needle at a uniform rate by means of rollers which are moved by a train of gearing, the whole being enclosed in a box beneath the scale.

In tests made with a draught horse drawing a cart and walking, it was shown to do 25,920 foot-pounds of work per minute, 7,080 foot-pounds less than the accepted unit of horsepower. This is an average result under favorable conditions, for, of course, resistance varies with the character of the road.

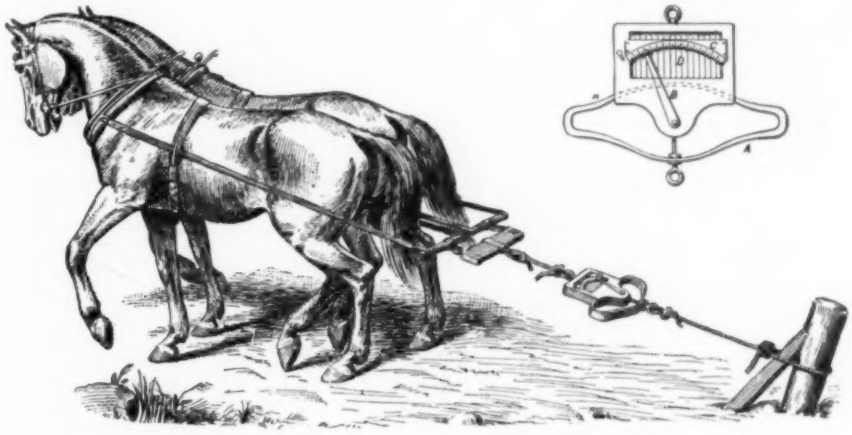


Fig. 5. Testing a Team by Means of a Dynamometer.

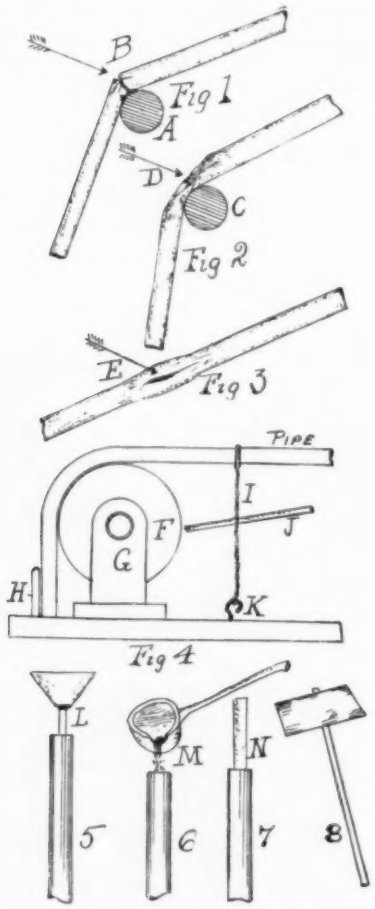
With these figures before us it is not difficult to believe that mechanical power will in time wholly usurp physical power in such cases as those under discussion. The illustrations are by courtesy of The Blacksmith and Wheelwright.

SUBMARINE SINKS CRUISER.

The submarine torpedo boat "Shark," commanded by Lieut. Charles P. Nelson, recently sank the cruiser "Columbia" of the North Atlantic training school—technically. The "Columbia," "Minneapolis" and "Prairie." were engaged in target practice at No Man's Land when their officers were apprised that an attack was to be made upon them by torpedo boats. The "Shark" succeeded in getting within 50 or 60 yards of the "Columbia" and thus technically sank that cruiser.

HOW TO BEND PIPES.

The process of pipe bending is not difficult when the right way is undertaken. If some other than the proper way is adopted, the chances are that the walls of the pipe will collapse, or the sides will be cracked or fractured. Split pipe, due to an attempt to make a bend in its course, is common. One may find samples of defective work of this nature in any shop and oftentimes in



the house. The accompanying illustrations will assist the novice in pipe bending. The usual method of making a bend is to work the pipe to the required oval shape over an object. Sometimes that object is the vise, or anvil, or it may be a round piece of metal or wood set up as shown in Fig. 1 at A. In making the bend over this object the chances are that the pipe will be broken off as at B, if sufficient pressure is applied, or the pipe shell may collapse as at D, Fig. 2; the mandrel is indicated at C. Again, we find that in many instances in pipe bending, the pipe shell is split open as at E, Fig. 3.

To avoid troubles of this kind and to preserve the original strength of the pipe, the best way is to make some forms over which to effect the bending. The process of "filling" or "packing" the pipe hollows first is adopted. One of the pipe bending forms of a rotating order is shown at Fig. 4. It is very easily constructed at slight expense. A platform of wood, about 3 feet long and 1 foot wide, is secured, to which is attached the stand, G, for bearing the bending disk, F. This disk is of hard wood, usually about 4 inches thick and 20 inches in diameter. A shaft made of wood is put through to sustain the wheel in the proper position and a bearing of the wooden stand is used for either side. The wheel or bending disk is therefore well sustained and is strong. There is a "check" pin at H, back of which the pipe to be bent is adjusted.

The "packed" pipe end is dropped back of this checking block and muscular power used to draw the pipe form back and down over the disk. In order to assist in the work, a strong metal hook is screwed into the wooden platform at K, and a cord, I, is connected with the hook and the pipe in process of bending. There is a "twisting" bar of wood, J, inserted into the twist of the cord and the bar can be turned and the pipe drawn down to a fuller degree.

Pipe Packing.

To try to bend the pipe cold on these forms or any other would almost invariably result in the breaking of the pipe walls, making it necessary to restore the walls or patch them. To overcome this danger the process of packing the interior of the walls with materials is adopted. Figure 5 illustrates the mode of pouring molten rosin into a pipe. The pipe is placed in an upright position and the lower end is plugged with a wooden plug or with clay. The tunnel, L, is adjusted into the pipe opening and the molten substance is poured therein. The process is simple. By this means the pipe becomes quite solid, due to the rosin hardening inside, and the bending can then be brought about without any likelihood of the walls collapsing. To get rid of the rosin afterwards is easy, as a slight heating will cause it to melt and run out of the pipe. It can be used again if desired.

Another method of pouring the rosin is

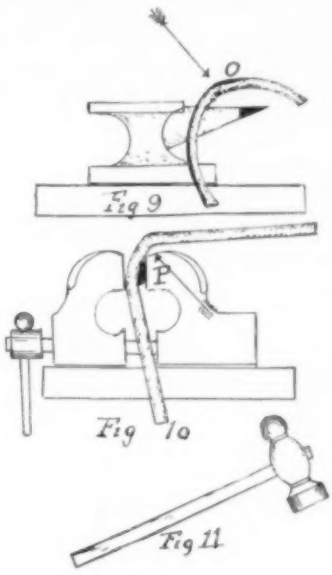
shown at Fig. 6, in which a common pouring ladle, M, is utilized, and the stuff is poured direct, instead of through a tunnel. When the clay-packing is used, the process is as in Fig. 7. Clay of ordinary character is selected, and lumps removed by the usual puddling and rolling. Then when the clay is in a putty-like condition, it is forced into the pipe channel. The packing is done by using a common wooden plunger, N. The plunger can be driven home by force or by using a mallet. The kind of mallet usually employed is shown at Fig. 8, although any sort of mallet would answer.

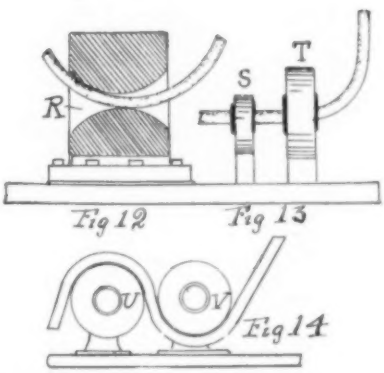
Different Forms of Bending.

The average man prefers to bend the piping by making use of the devices at hand. There is always considerable bother attached when it is necessary to construct special forms for bending. Often the forms are used only a few times. Therefore a goodly proportion of the bending of pipes in shops, workrooms, homes and other places is done by resorting to the vise or the handy anvil. In Fig. 9 we illustrate the process of working the packed cold pipe over the anvil. Of course if the pipe were heavy, or the metal thick, this could not be done, but ordinary piping can be bent in this form without much difficulty. After the filling of the pipe is accomplished, the pipe is grasped with a hand at either end and the ends pressed down with the anvil as the center point. In order to assist in getting the properly described circle, the common machinist's metal hammer with bell head is used. The strokes are applied at the point O, and the left hand holds the base end of the pipe. In this way the pipe can be brought to a prescribed circle without fracturing the metal. If the vise is used, there is danger of making abrupt turns, as in Fig. 10, unless precautions be taken to avoid this trouble. The grip is usually made on the loaded pipe and then the bend is attempted by forcing with the hands. I would first make forms for the vise, so that the forms can be closed in on the pipe and protect it. Then the proper bends can be made without danger of depressing the shell. The bell hammer is also used in this work. One of the handy styles of hammers is shown in Fig. 11. This is the common machinist's type and can be purchased at any of the hardware stores. It is a mistake to attempt to get the desired bends in the pipe with the claw hammer. A mallet may be used to some advantage and without danger of injuring the metal pipe shell.

A Handy Form for Quick, Light Bending.

It frequently happens that there are light pipes to be bent on which it is not desired to spend much time. Figure 12 is a drawing of a form which is readily made for this purpose. Get a block of seasoned hard wood, about 6 inches long and same size in height and breadth. Take it to a woodworking establishment and have it bored through, say with a 2-inch bit. Then have the hole tapered from the center on





either side. This gives it the shape shown in the sectional drawing of the block at R, Fig. 12. The block is then screwed or bolted to the base block and it can be used for the purpose of bending pipe in various directions.

Another little scheme that is simple and handy is shown in Fig. 13. There is a base piece used for a platform and to this base

is mortised the stands T and S. These stands are pieces of hard wood, of sufficient strength to carry metal sleeves. The sleeves are simply sections of metal cut from pieces of pipe the next size larger in diameter than any pipe calculated to be bent in the form. The pipe for bending can be inserted through the holes as illustrated and, by using force, the pipe can be bent to desired angles. The serial roller system of pipe bending on the bench of the workshop by hand is shown in Fig. 14. This consists in having two, three, four or more disks. U and V, set up on wheel pins or studs. The latter are fixed to proper stands and the stands fit firmly into a foundation plank. Only the lighter forms of pipes can be bent in these contrivances. The work involves the application of muscular power and considerable tapping with a wooden mallet. The object is to get the pipe in prescribed circles about the forms as shown. The form is of service when it is desired to get

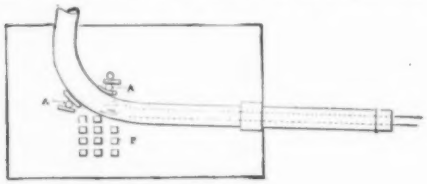


Fig. 15

piping adjusted in forms kindred to the letter S.

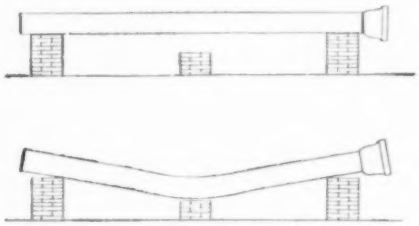
Bending Large Pipe.

The method of bending large wrought-iron pipe up to a diameter of 8 inches and to a circle of 5 feet radius illustrated at Fig. 15 is given by a correspondent of the American Machinist:

A templet of about ⅛x1-inch stock is first made by the blacksmith. The pipe to be bent is laid on a table of gray iron having tapering holes, B, about 1¼ inches square over the entire surface to receive bars about a foot long. It is evident that by placing the pipe between two such bars as per sketch and putting a strain on the end of the pipe that the pipe will bend. It is well to reinforce the bars as shown. The method of heating the pipe is perhaps the best feature of the job. What is really a large blow pipe is made of two concentric pipes, natural gas being the fuel and a blower from a blacksmith's fire furnishing the air. By means of a simple arrangement of fittings, including some rubber hose, it was made so that the flame could be turned on any part of the pipe to be bent. The flame was, of course, inside the pipe to be heated. By this method a good, smooth job can be done. I might also mention the pieces marked A in the sketch are used to prevent the pipe being marred.

BENDING CAST-IRON PIPE.

One rarely has occasion to bend cast-iron pipe, but if only straight pipe were on hand and a curve were to be turned, it would be somewhat of a problem to bend the pipe. A correspondent to the Journal of Electricity, Power and Gas tells a simple method he has of bending the pipe. Two or more pipes are placed on piers in the forge, as



Bending the Pipe

shown in the sketch, the central pier being shorter than the end piers according to the angle of the curve to be turned. The fire is then built up around the pipes until they warp down in the center and touch the central pier wall. The fire is then knocked out, no water being used to extinguish it. Good bends may be made in this way in pipe that must bear a high pressure. The wood is piled after the manner that a blacksmith heats his tires.

HOW TO TEMPER A BUTCHER KNIFE.

The following simple method of tempering a butcher knife is given by a correspondent of the Blacksmith and Wheelwright:

Make a small box, say 4x4, or 4x6, and

To Temper a Butcher Knife

about 18 or 20 inches long, leaving one end open. Fill it with stone coal ashes, the finer the ashes the better. Wet the entire contents of the box with clear cold water. When your knife is ready to temper, heat to a cherry red and thrust into the wet ashes and let it remain until cold. It will come out good metal from hilt to point and from edge to back.

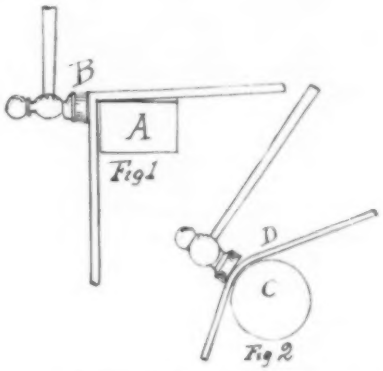
MECHANICS FOR YOUNG AMERICA

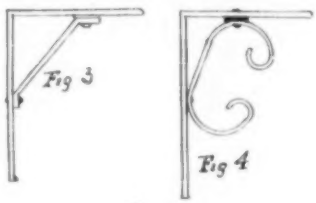
SOMETHING FOR BOYS TO MAKE.

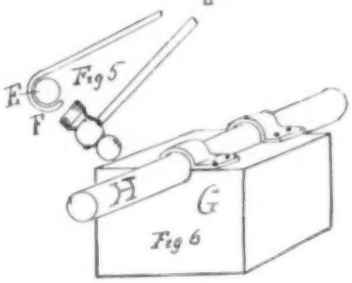
Many an industrious lad has made money manufacturing the common forms of wood brackets, shelves, boxes, stands, etc., but the day of the scroll saw and the cigar-box wood bracket and picture frame has given way to the more advanced and more profitable work of metal construction. Metal brackets, stands for lamps, gates, parts of artistic fences for gardens, supporting arms for signs, etc., are among the articles of modern times that come under the head of things possible to construct of iron in the back room or attic shop. The accompanying sketches present some of the articles possible to manufacture.

First, it is essential that a light room be available, or a portion of the cellar where there is light, or a workshop may be built in the yard. Buy a moderate sized anvil, a vise and a few other tools, including bell hammer and this is all required for cold bending. If you go into a forge for hot bending, other devices will be needed. Figure 1 shows how to make the square bend, getting the shoulder even. The strip metal is secured at the hardware shop or the iron works. Often the strips can be secured at low cost at junk dealers. Metal strips about half an inch wide and one-eighth of an inch thick are preferable. The letter A indicates a square section of iron, though an anvil would do, or the base of a section of railroad iron. The bend is worked on the corner as at B, cold. If a rounded bend is desired, the same process is applied on the circular piece of iron. This is shown in Fig. 2 at C. This piece of iron can be purchased at any junk store, where various pieces are always strewn about. A piece about 20 inches long and 4 inches in diameter is handy. The bend in the metal begins at D and is made according to the requirements. Occasionally where sharp bends or abrupt corners are needed, the metal is heated previous to bending.

Although the worker may produce various forms of strip-metal work, the bracket is, as a rule, the most profitable to handle. The plain bracket is shown in Fig. 3, and is made by bending the strip at the proper angle on form A, after which the brace is adjusted by means of rivets. A rivet hole boring tool will be needed. A small metal turning or drilling lathe can be purchased for a few dollars and operated by hand for the boring, or a common hand drill can be used. Sometimes the bracket is improved in design by adding a few curves to the end pieces of the brace, making the effect as shown in Fig. 4. After these brackets are made they are coated with asphaltum or Japan; or the brackets may be painted or stained any desired shade.







In some of the work required, it is necessary to shape a complete loop or circle at the end of the piece. This may be wrought out as in Fig. 5. The use of a bar of iron or steel is as shown. The bar is usually about 2 inches in diameter and several feet in length so that it will rest firmly on a base

of wood or stone. Then the bending is effected as at F, about the bar E, by repeated blows with the hammer. After a little practice, it is possible to describe almost any kind of a circle with the tools The bar can be bought at an iron dealers for about 40 cents. From the junk pile of junk shop one may get a like bar for a few cents.

A convenient form for shaping strip-metal into pieces required for brackets,

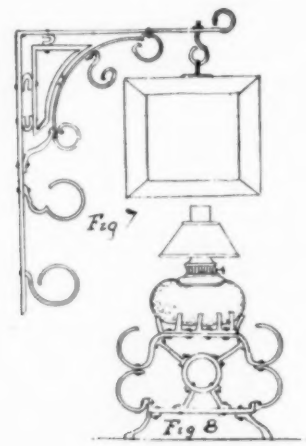


Fig 7

Fig 8

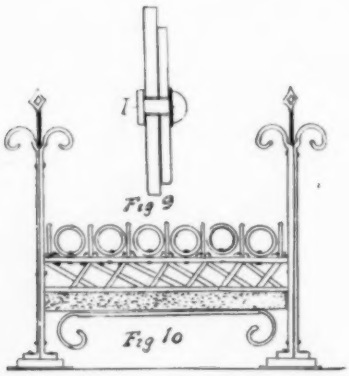


Fig 9

Fig 10

fences, gates, arches, and general trimmings is illustrated at Fig. 6. First there ought to be a base block, G, of hard wood, say about 2 feet square. With a round point or gouging chisel work out the groove to the size of the bar, forming a seat, by sinking the bar, H, one half its depth into the wood as shown. In order to retain the bar securely in position in the groove, there should be two caps fitted over it and set-screwed to the wooden base. These caps may be found in junk dealers' heaps, having been cast off from 2-inch shaft boxes. Or if caps are not available, the caps can be constructed from sheet metal by bending to the form of the bar, allowing side portions or lips for boring, so that the caps can be set-screwed to the wood. Thus we get a tool which can be used on the bench for the purpose of effecting series of bends in strips of metal.

Since the introduction of the laws requiring that signs of certain size and projection be removed from public thoroughfares in cities, there has been quite a call for short sign backets, so termed, of the order exhibited in Fig. 7. These sign-supporting brackets do not extend more than three feet out from the building. A boy can take orders for these signs in almost any city or large town with a little canvassing. The sign supporting bracket shown is merely a suggestion. Other designs may be wrought out in endless variety. A hook or eye is needed to sustain the ring in the sign.

The young man who undertakes to construct any sort of bracket, supports, frames or the like, will find that he will get many orders for lamp-supporting contrivances, such as shown at Fig. 8. It is hardly necessary to go into details for making these stands as every part is bent as described in connection with the bending forms, and the portions are simply riveted at the different junctures. Both iron and copper rivets are used as at I, in Fig. 9, a cross sectional view.

The best way is to bore straight through both pieces and insert the rivet. In some cases the rivet is headed up in the bore and again washers are used and the heading effected on the washer. Copper rivets are soft and easily handled, but are costly as compared with iron rivets.

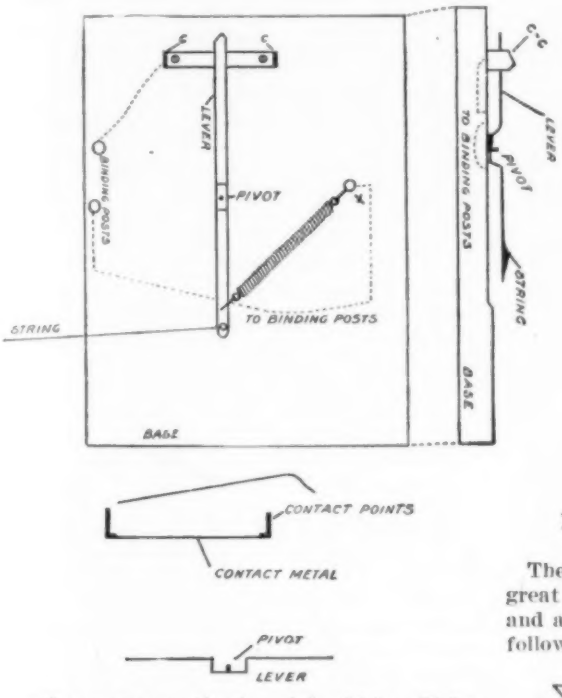
Good prices are obtained for the guards for open fireplaces made in many varieties in these days. The return of the open fireplace in modern houses has created a demand for these guards and in Fig. 10 we show a design for one of them. The posts are made sufficiently stiff by uniting two sides with rivets. The ends at top are looped as shown, while the ends or butts at the base are opened out to make the feet. Rings are shaped on forms and are then riveted to the base cross-piece as illustrated. Crosses are made to describe to central design and the plan is worked out quite readily with the different shapes.

Bologna sausage is now being adulterated with corn meal. The meal is harmless, of course, the imposition consisting in paying 12 cents a pound for meal.

HOW TO MAKE A SIMPLE BURGLAR ALARM.

BY THOMAS M'CALL.

Take a piece of any wood about 6 by 8 inches for the base. This may be finished in any way desired. For the contact points



use brass or any sheet metal which will be satisfactory. Take a piece about 2½ or 3 inches in length and bend the ends up about one-half inch in a vertical position as shown. Fasten this to the top of the board using screws or nails. Under this strip of metal fasten a copper wire which can be connected to a binding post on the board if desired. Take another piece of metal about 4½ inches in length and make a lever of it in the shape shown in the diagram. Fasten this so that one end of it will swing freely, but not loosely between the ends of the other piece marked C-C. Near the end fasten a spiral spring (S) which can be obtained almost anywhere. Fasten the end of this to the screw marked X. Also fasten to this screw a copper wire leading to the binding post. In the lower end of the lever make a small hole to fasten a string to.

This string may be fastened across a door or window and any movement of it will pull it to the contact point on the right. If the string is cut or broken the spring will pull the lever to the contact point on the left and thus complete the circuit.

It may be best to use an automatic circuit closer with this as the contact is liable to be made for only a few seconds. Such a circuit closer was described in Popular Mechanics for May 23, 1903.

If the string is burned it will also act as a fire alarm.

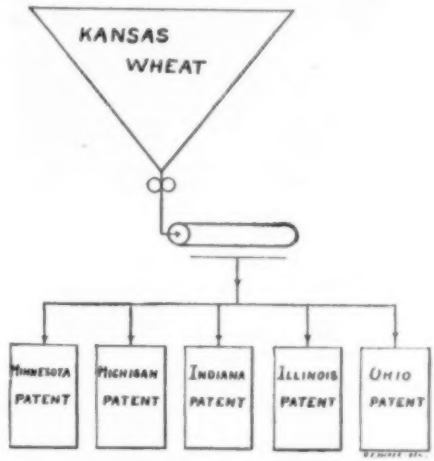
NOVEL CHESS GAME.

Some officers of the U. S. Navy played the most novel game of chess on record not long ago.

The United States cruiser "New York" was cruising down the western coast from San Francisco to Magdalena Bay. Several miles away was the cruiser "Boston." The officers on the two ships engaged in the game of chess by means of wireless telegraphy, making their moves almost precisely as though they had been on the same ship. The players of the "Boston" won the game.

KANSAS WHEAT IN DEMAND.

The grain dealers of Kansas are shipping great quantities of wheat into other states and a prominent milling paper publishes the following cartoon in explanation of where

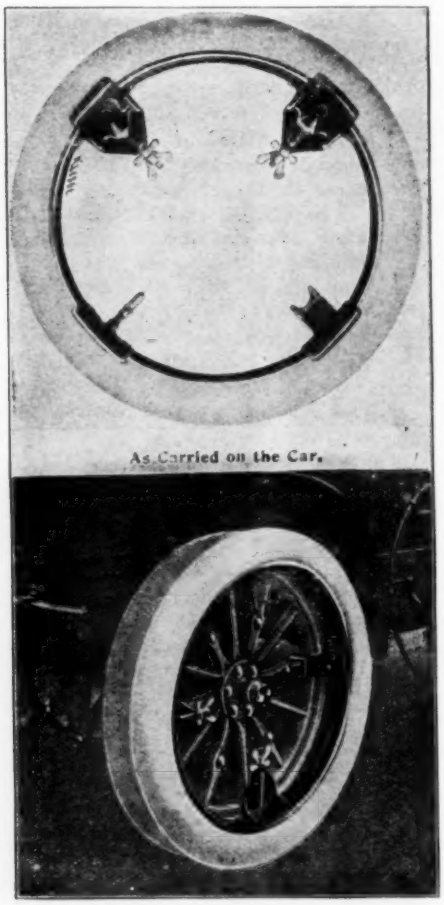


the favorite state brands of flour get their supply.

Mills in practically every state east of the Missouri river are buying Kansas wheat.

EMERGENCY WHEEL FOR AUTOS.

A tire manufacturer in South Wales has devised an emergency wheel which can be applied in a few minutes. The Motor News, Dublin, says:



As Carried on the Car.

Attached to the Car

"The wheel is merely a rim on which a tire is kept always inflated. It is fitted with three metal clamps arranged to grip the periphery and spokes of the wheel it is to be attached to, and is held locked by two simple thumb screws. It is easily carried on the step of the car, and in that position is in no sense an encumbrance."

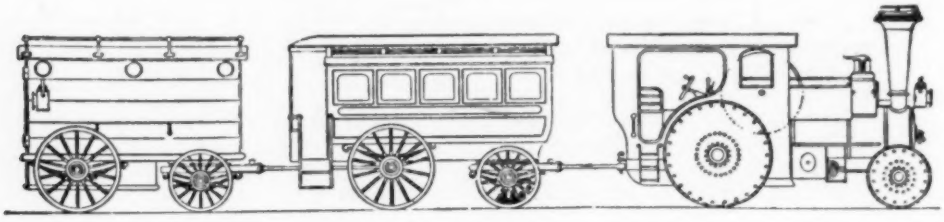
TEST MOTOR CARS FOR SUBURBAN SERVICE.

Motor cars will not be used yet awhile on the Burlington railroad for handling Chicago suburban traffic, and on branch lines. A short time ago operating officials of that road tested a gasoline electric motor car in a trial run from Aurora to Chicago and return. The motor was of 225 horsepower operated by electricity generated by a gasoline engine and drew two trailers making at times a speed of 30 miles an hour. The speed is sufficiently high for the service required, but the motor did not work altogether satisfactorily and considerable vibration was caused by two large fly-wheels. The road has not given up the idea, however, but will endeavor to correct the faults.

PROPOSED ROAD LOCOMOTIVE AND TRAIN.

An English engineer of prominence, who is a firm believer in the advantages and future of the road locomotive service, offers a model type which is shown in the cut.

Care has been taken to avoid the usual objection of the road engine, which as at present constructed is liable to frighten horses. In the proposed construction the moving parts of the driving machinery are concealed, and noise reduced to a minimum. The train as suggested contains a passenger car or omnibus mounted on four wheels and seating 20 passengers. The rear trailer is for trunks, express and light freight packages. In France traction engines of this class make eight miles an hour easily, over roads which are both rough and hilly. Such trains are in regular service between Lyons and Grenoble, a distance of 70 miles, the trip being made in the night—one train each way.



I Spend the First Dollar

I will pay for your first bottle of Dr. Shoop's Restorative.

There are no conditions. Nothing to deposit. Nothing to promise. The dollar bottle is free.

Your druggist, on my order, will hand you a full dollar's worth and send me the bill.

I shall spend $100,000—half a million, perhaps,—this season that you may learn how Dr. Shoop's Restorative strengthens the INSIDE nerves—the nerves that control the vital organs. That you may know for yourself, after a fair, free test in your home, that this is something uncommon—something UNUSUAL in medicine. Not a narcotic or a deadening drug—but a strength-building, life-inspiring, tonic that gives lasting power to the very nerves that control the vital processes of life.

Dr. Shoop's Restorative

If the worries of business have left their scars on your good health; if careless habits have made you a wreck; if your nerve, your courage is waning; if you lack vim, vigor, vitality; if you are beginning to wear out; if your heart, your liver, your stomach, your kidneys, misbehave—this private prescription of a physician of thirty years standing will strengthen the ailing nerves—strengthen them harmlessly, quickly, surely, till your trouble disappears.

Inside Nerves!

Only one out of every 98 has perfect health. Of the 97 sick ones, some are bed-ridden, some are half sick, and some are only dull and listless. But most of the sickness comes from a common cause. The nerves are weak. Not the nerves you ordinarily think about—not the nerves that govern your movements and your thoughts. But the nerves that, unguided and unknown, night and day, keep your heart in motion—control your digestive apparatus—regulate your liver—operate your kidneys. These are the nerves that wear out and break down.

It does no good to treat the ailing organ—the irregular heart—the disordered liver—the rebellious stomach—the deranged kidneys. They are not to blame. But go back to the nerves that control them. There you will find the seat of the trouble.

There is nothing new about this—nothing any physician would dispute. But it remained for Dr. Shoop to apply this knowledge—to put it to practical use. Dr. Shoop's Restorative is the result of a quarter century of endeavor along this very line. It does not dose the organ or deaden the pain—but it does go at once to the nerve—the inside nerve—the power nerve—and builds it up, and strengthens it, and makes it well.

Don't you see that THIS is NEW in medicine? That this is NOT the mere patchwork of a stimulant—the mere soothing of a narcotic? Don't you see that it goes right to the root of the trouble and eradicates the cause?

But I do not ask you to take a single statement of mine—I do not ask you to believe a word I say until you have tried my medicine in your own home at my EXPENSE absolutely. Could I offer you a full dollar's worth free if there were any misrepresentation? Could I let you go to your druggist—whom you know—and pick out any bottle he has on his shelves if my medicine were not UNIFORMLY helpful? Would I do this if I were not straightforward in my every claim? Could I AFFORD to do it if I were not reasonably SURE that my medicine will help you?

Simply Write Me.

But you must write ME for the free dollar bottle order. All druggists do not grant the test. I will then direct you to one that does. He will pass it down to you from his stock as freely as though your dollar laid before him. Write for the order to-day. The offer may not remain open. I will send you the book you ask for beside. It is free. It will help you to understand your case. What more can I do to convince you of my interest—of my sincerity?

Simply state which book you want and address Dr. Shoop. Box 2353 Racine, Wis.

Book 1 on Dyspepsia
Book 2 on the Heart
Book 3 on the Kidneys
Book 4 for Women
Book 5 for Men
Book 6 on Rheumatism

Mild cases, not chronic, are often cured with one or two bottles. For sale at forty thousand drug stores.

THE IDEAL SIGHT RESTORER

WE RESTORE SIGHT!

GLASSES RENDER DEFECTIVE VISION CHRONIC.

Write for our ILLUSTRATED TREATISE, Mailed Free.

THE IDEAL COMPANY, 239 BROADWAY, NEW YORK.

SAVE MONEY! GET SECURITY! HOW?

By Installing A

Holtzer Watchman's Clock

Many a watchman has caught a blaze like this when on his rounds ringing in on a Holtzer Watchman's Clock.

It Reduces Your Insurance Rate | **It May Save Your Factory**

Do not wait until the fire catches you but write us to-day. Let us tell you all about it. **Ask for bulletin No. 1152.**

Holtzer-Cabot Electric Company

New York 395 Dearborn St., Chicago Brookline, Mass.

BIG BRASS BAND OFFER.

We sell the celebrated IMPERIAL, DUPONT and MARCEAU Band Instruments at about one-half the prices others ask for the same High grade goods. For our Free Band Instrument Catalogue, also our Free Booklet, entitled, "How to Buy Band Instruments," for large illustrations and complete descriptions of our three large lines of brass instruments, also everything in Drums, Clarionets, Flutes, Saxophones, etc., etc., for the free catalogues, our guarantee and refund proposition, for the most liberal band instrument offer ever heard of, for the new method of selling instruments fully explained, for something new and immensely interesting to every bandman, cut this ad out and mail to us today. **SEARS, ROEBUCK & CO., CHICAGO.**

WANTED

10 men in each state to travel, tack signs and distribute samples and circulars of our goods. Salary $60.00 per month, $3.00 per day for expenses.

KUHLMAN CO., Dept. C, Atlas Block, CHICAGO

A. D. 2000.

Give me a spoon of oleo, ma,
And the sodium alkali,
For I'm going to make a pie, mamma;
I'm going to make a pie.
For John will be hungry and tired, ma,
And his tissues will decompose;
So give me a gramme of phosphate,
And the carbon and cellulose.
Now give me a chunk of caseine, ma,
To shorten the thermic fat,
And give me the oxygen bottle, ma,
And look at the thermostat.
And if the electric oven is cold,
Just turn it on half an ohm,
For I want to have the supper ready
As soon as John comes home.

ENGLISH SAFETY SYSTEM OF TRAIN DISPATCHING.

In England the movement of trains is controlled by what is known as the tablet system. These tablets are made of aluminum, or on the South African railways of fiber, and weigh about two ounces each. Each division has its own set of tablets, which will not fit the machines of any other division. The tablets can be exchanged while the train is going 60 miles an hour.

The essential point in the new system is that no engine driver is allowed to leave a station without a tablet in his possession, and the element of safety rests on the fact that the machines are so made that it is impossible for two of the tablets to be out at the same time. If a driver leaves A for B with a tablet, that tablet has to be deposited in the machine at B before another tablet is issued allowing a return train to leave that station for A, and the electrical connection between the two stations makes it impossible to extract a tablet from the A machine until the tablet has been put into the machine at B. It is claimed by railroad experts that under the new system two trains cannot be on the same section at once, so that the danger of collisions is entirely done away with, and that no serious accident has occurred on any English road so equipped during the past 30 years.

RAPID TRANSIT IN SPAIN.

Trains in Spain are among the slowest in the world. A rate of ten or twelve miles an hour is considered a good average of speed for everyday travelers. When the Spanish officials wish to show visiting foreigners what they really can accomplish in the way of speed, they offer express trains which dash madly across the country at an average rate of about eighteen miles per hour.

HOW TO PREVENT ARTIFICIAL LIGHT DEVELOPING PAPER FROM CURLING.

Lay out blotters. On these place muslin from which starch has been washed out, and keep the muslin for just this purpose, says a writer in the American Amateur Photographer. Take prints from the wash water and lay face down on the muslin. When prints are just dry enough so that films will not adhere, and yet while quite damp, they are rolled, film out, around a roller 1½ to 2 inches in diameter. (I use a piece of background roller, the sort they are shipped around), then a small rubber band is placed around each end and the roller removed, leaving a circular form of the rolled prints. All are prepared in this manner (it takes less time to do than to tell), and they are allowed to become stone dry while in this shape, thus allowing the pores of the gelatine film to stretch. The rubber bands are then removed, and if necessary three or four prints at a time are rolled the other way around the roller to make them lie flat. Having been stretched while drying they will not curl again. I find it advisable, when heavy paper with smooth surface is used, to, before placing on the roller, curl the ends of the print backward with a ruler, to prevent the sharp edge marking across the face of the print during the drying process.

NEW BOOKS.

LAIRD & LEE'S DIARY AND TIME-SAVER FOR 1905. Red morocco, vest pocket size. Laird & Lee, Chicago. Price, 25 cents. The sixth annual edition of this valuable little book contains many items of timely interest which its owner will have occasion to refer to during the year. There is also a page for full identification description besides the memoranda pages for every day in the year, and a calendar, cash account and 13 maps.

HOW TO WRITE SIGNS, TICKETS AND POSTERS. Edited by P. N. Hasluck, 160 pages; 170 engravings and diagrams. Cassell & Co., Ltd., New York. Price, 50 cents. Treats of the formation of letters, stops and numerals; the signwriter's outfit; making signboards and laying ground colors; the simpler forms of lettering; shaded and fancy lettering; painting a signboard; ticket-writing; poster painting and lettering with gold. Each phase of the subject is handled skilfully and in a manner calculated to give the reader the greatest amount of information in the least time expended.

MOUNTING AND FRAMING PICTURES. Edited by Paul N. Hasluck. 160 pages; 240 engravings. Cassell & Co., Ltd., New York. Price 50 cents. Treats of making picture frames; art frames; gilding picture frames; picture frame cramps; making Oxford frames; mounting pictures; making photograph frames, covering frames with plush and cork and hanging and packing pictures. Tells how to do the work and it is safe to say that after studying the book the average person could go ahead and make the articles it describes.

A tramp recently rode from Mena, Ark., to Kansas City, a distance of 380 miles, in a trunk. When he left his cramped quarters he was as hungry and thirsty as a hobo ever gets.

Compressed air is reported to have made possible a visit to a dangerous valley in the mountains of Mindanao, in the Philippines. The valley is filled with a poisonous vapor which arises from the crater of an old volcano. There are rich deposists of gold there which have been out of reach. A party of Americans is reported to have taken tanks of compressed air along for breathing purposes and secured a large quantity of gold-bearing sand.

Hydrozone

Cures

Sore Throat

A Harmless Antiseptic.

Endorsed by the medical profession. Send ten cents to pay postage on **free trial bottle.** Sold by Leading Druggists. Not genuine unless label bears my signature:

Prof. Charles Marchand

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Write for free booklet on Rational Treatment of Disease.

A light when you want it. No chemicals, oil, smoke or odor. Indorsed by Army and Navy, and all Detective Dep't's. Send us $1.00 and we will ship flashlight complete immediately prepaid. Other Specials: Electric Motors, $1.50 and 15c postage. Electric Top, 75c and 15c postage. Shocking Machine, $1.00 and 20c postage. Write for our book No. 6 of Electrical Goods. IT'S FREE. J. ANDRAE & SONS CO., 493 W. Water St., Milwaukee, Wis.

Magic Trick Cards.

With these cards you can perform some of the most wonderful illusions You can change eights to duces, blacks to reds, etc. The transformations are truly wonderful. **Price, 10 cents** with instructions, and our Big Bargain Catalogue.

Address
Western Specialty Co., 532 E. Minnehaha St., St. Paul, Minn.

To Manufacturers

If you wish to introduce your products into the Republic of Mexico through a progressive, up-to-date, reliable agency, address us.

Ekins & MacQuiston,
Mftrs. Agents
Apartado 74, Mexico City, Mexico

RHEUMATISM

CURED WITHOUT MEDICINE

New Remedy Discovered Which Absorbs Acid Impurities Through the Large Foot Pores.

A DOLLAR PAIR FREE

On Approval--Write To-day.

Don't take medicine for Rheumatism, but send your name to the makers of Magic Foot Drafts, the great Michigan discovery which is curing every kind of Rheumatism without medicine—chronic or acute—Muscular, Sciatic, Lumbago, Gout, etc., no matter in what part of the body. You'll get the Drafts by return mail. If you are satisfied with the relief they give, send us one dollar. If not, send nothing. **YOU DECIDE.**

Magic Foot Drafts possess the remarkable quality of absorbing from the blood the impurities which cause Rheumatism, curing where everything else has failed. They are even curing cases of 30 and 40 years' standing. They will cure **YOU.** Send your name today to Magic Foot Draft Co., 1151 Oliver Bldg., Jackson, Mich. Our splendid new book on Rheumatism comes free with the Drafts. Send no money—only your name. Write today.

CARPETS ON TRIAL

Cut this ad. out and send to us, or one postal card say, "Send me your Free Carpet Catalogue," and you will receive free by return mail, postpaid, full particulars how we furnish anyone, free, a big variety of large samples of Ingrain, Brussels and Velvet Carpets, you will get our Big Book of Carpets, **beautifully illustrated and fully described,** over 100 beautiful color plate samples of carpets reduced from 1¼-yard lengths, **THE BIG FREE BOOK shows an almost endless variety of Carpets, Art Squares, Rugs, Matting, Oilcloth, Linoleum, Shades, Curtains, Draperies, Upholstery, etc.** Yard width carpet, 11c per yard and upwards; big rugs with fancy border and fringe to cover big parlors, **$1.92** and up. **We will explain why we can sell CARPETS AT ABOUT ONE-HALF THE PRICE OTHERS CHARGE.**

OUR FREE TRIAL PLAN will be fully explained. How we cut and make carpet in any shape to fit any room, our binding quality guarantee, our pay after received terms, quick delivery, color scheme, very little freight charges, all will be explained to you. Cut this ad out and send to us or on a postal card say, "Send me your Free Carpet Catalogue," and you will get all this free, and you will get our very latest and most astonishingly liberal carpet offer, a carpet proposition never known of before. **WRITE TODAY and see what you get FREE by return mail, postpaid.** Address,

SEARS, ROEBUCK & CO., Chicago.

PEANUTS and POP CORN

A BUSINESS THAT PAYS

Machines are earning from $35 to $60 per week. Catalog Free.

S. DUNBAR & CO.
18 & 20 No. Desplaines St.
CHICAGO

CLOCK WITH LOUD TICK FOR AFRICANS.

A Birmingham clockmaker discovered that a rival was sending out large stocks of cheap clocks to the heart of Africa, and doing good business with them. He spent a large sum in making better clocks and shipped thousands of them to the same market. Strange to say, his sales were small; although his rival, turning out a cheap and inaccurate timepiece, was selling all he could make. Finally, he found a key to the mystery. Savages like noise. The clocks made by the first exporter had a particularly loud and aggressive tick. His competitor had made a better clock, but it was almost noiseless, and the savages would have none of it. The next cargo of clocks which the Birmingham maker shipped to the Guinea coast ticked louder than anything ever heard there, and they sold like pink lemonade at a circus. —London Daily Mail.

A SAD STORY.

Wrigley Johnson, who was caught sleeping in a box car in the B. & O. S. W. yards early yesterday morning, evaded punishment in the police court by relating a few of his experiences on the road.

"Judge, Oiv's nuttin' ter deny. Oi stand pat. Oim a hobo pure an' werry simple. Oiv'e hiked it from New York ter Frisco on the cinder paths en' de back roads. Oiv's gnawed ice from de glaziers of Winnipeg, sucked oranges in Floridar, an' rassled wit' chile con carne in Mexico, where de salve comes from. Oi have lost me chum. His name was 'Pinhead' Morrissey. He was well noimed.

"He was a dear old pal an' he prevented a big wreck on the Santa Fe by a little headwork. We was stowed away in an empty in der middle of a long freight which was clawin' its way over der Rockies. On de summit de train broke in two. We was in the foist section. De runaway bunch ob cars come tearin' down de mountain in a sheet of fire and a cloud of smoke. De engineer trun her wide open and our section went humpin' purty lively down der poike.

"Well, he gauged de distance pretty well, an' when the runaways caught up wid us der was not much of a kerlision. Homsomever dey were liable to break away again. It was necessary to couple 'em up again. Me and 'Pinhead' got up on de roof of our car. Dere was no couplin' pin. De link of de foist car in de wild bunch in some way was shoved nicely into de coupler. All was needed was a link. We frisked ourselves ter see if we had one in our pockets, but dere was none.

"A happy thought struck 'Pinhead.' 'Watch me!' he yelled. He ran to de end ob de last car in our bunch, threw his hands up and dove. Would you believe it, he hit de hole in the drawbar fair and square. His nut slipped inter de hole and passed tro' de link. His body was rigid and by stiffenin' his neck a little he kept dat train together until we got to a water tank, where we were heroes for fair."

Police court attaches were stunned. All were silent for a time and then Acting Judge Schwab said: "Dismissed; that was a bird."—Cincinnati Enquirer.

PICK COTTON TO RAISE CHURCH MONEY.

The cotton is white for the harvest, but, verily, the pickers are few. At Terrell, Texas, a Sunday School class are earning their donation to the church fund by picking cotton at 75 cents per hundred pounds. The class earned $5.30 the first day. In the vicinity of Augusta, Ga., picking is being carried on by moonlight, those working from sundown to midnight receiving a bonus.

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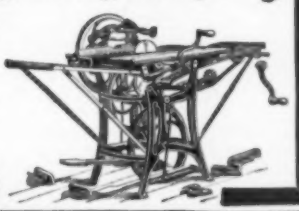

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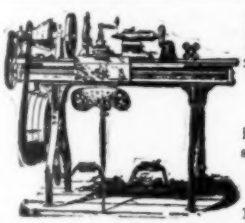
In order to rid Canadian waters of the dogfish pest, the minister of marine and fisheries has decided to establish three reduction plants to convert the fish into fertilizer and glue, says United States Consul-General Holloway at Halifax. It was first intended to offer a bounty on the pest, but afterwards decided that this method would not completely exterminate it.

Each of the reduction plants will cost $9,000 and will be operated by the government. Fishermen will be paid a good price for the fish offal and dogfish they bring in and the minister believes the enterprise will yield a fair profit.



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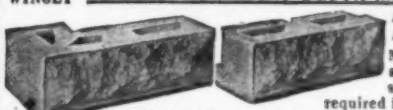

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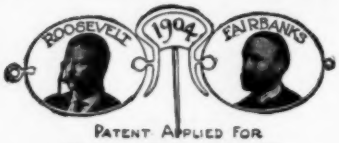

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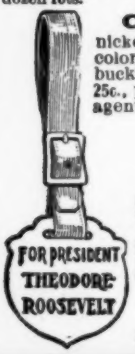

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HOW TO SHAVE YOURSELF AND KEEP YOUR RAZOR IN GOOD CONDITION.

Honing, Stropping and Other Mysteries of the Tonsorial Art Explained for the Amateur.

By Hirst Clem Stewart.

Although men have been shaving since an instrument that would cut their whiskers was invented, comparatively few, even yet, know how to shave themselves. The razor was alluded to by Homer and in ancient times shaving was in fashionable use by the Greeks and Romans as a mark of distinction. Savage nations, the Tahitians, for instance, used pieces of shell and shark's teeth upon which they ground very fine edges sufficiently sharp to remove the beard. Such razors are yet in use among some of the uncivilized tribes. Shaving was introduced among the Romans about 300 B. C. Pliny says Scipio Africanus was the first Roman to shave every day.

From earliest times the wearing of beards has been a matter of fashion, an extreme in one way usually being followed by an extreme in the other. Just now smooth faces, or merely moustaches, are in vogue and hence it behooves all men to learn to shave themselves.

If you are able to have your own private barber who shaves no other but you, it is probably more satisfactory than shaving yourself. Otherwise it is not. Many who would scorn to wash their faces in the water used by another person, do not hesitate to have their faces lathered by the brush that has gone over a hundred faces before; their skin rubbed by the barber's hand that has rubbed the skin of twenty other faces the same day, and their whiskers shaved by a razor that has shaved scores of men previously. The barber may wash his hands well, may carefully cleanse his brush, but he usually dips his brush into the same mug of soap and on some faces there are germs that adhere to the barber's hands and which washing the hands will not obliterate. Many serious skin diseases have thus been contracted. But aside from the danger, it is unclean.

Therefore shave yourself. Buy a good razor, strop and brush. The price of each is usually the best index of the quality, though opposing opinions are many. It is better to have two or three razors, for a razor is a delicate piece of steel and requires an occasional rest. This is the most peculiar characteristic of the razor and one that cannot satisfactorily be explained. But you can easily observe it yourself. If you have two razors and one gets so that it will scarcely cut your whiskers, just lay it aside for two or three weeks. Then try to use it again and the chances are that it will shave most satisfactorily.

How to Strop a Razor.

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rule is to not over-do it. Many people strop the life out of a razor. Why, I had a man tell me the other day that he stropped his razor for five minutes and then it would not cut, which, he said, proved that the razor was no good True, it was no good now, but it was because he had stropped it too much. In over-stropping you get a round edge on the razor and it goes over the face like the runner of a sleigh over the snow. What you want is a sharp, keen-cutting edge, and if you strop your razor four or five times lightly, it will shave with comfort, provided it has not already become dulled from too much stropping. In stropping be sure and do not press the razor hard against the strop. Do not lift the blade off the strop; merely turn it over on its back each time, with the back always against the strop, as a pivot. By this means you secure one long bevel instead of a dozen little bevels. Remember that a razor's edge under the microscope looks like a fine saw and the finer the teeth the keener the edge. A cheap strop will spoil the best razor made, so always be careful to buy a good strop.

With your razor stropped so that it will shave smoothly you are ready to shave. Make a substantial stiff lather in the mug by using a small amount of moderately warm water. Lather your face well with the brush and then rub the lather well into your face with your fingers. The longer you lather and the more you rub the easier the shaving. Shave the cheeks downward and always guide the razor in the direction the whiskers grow. In planing a board it is a hard job if you plane against the grain, and you often ruin the board. So it is in shaving a hard task shaving against the grain and you are liable to ruin your face, or make it very sore. Use a sliding motion as well as downward in handling the razor, for it thus gives double service to the stroke. In holding the razor, lay it as flat as possible—the back of the razor touching the face. Do not pull the razor straight down the face with one stroke of the hand as if you were cutting grass, but give it a diagonal and swinging motion as if you were sawing the whiskers off.

If you should accidentally cut yourself, wash with cold water and rub the cut with a piece of lump alum. That stops the bleeding at once and helps to heal the cut.

In beginning shaving, start on the right side of the face. Looking in your mirror see that you hold the razor flat against the face, and with the arm reaching over the head draw the skin tight with the left hand. In shaving the right side of the face under the jaw bone, draw the skin with the left hand and continue cutting downward as far as the center of the neck. The skin is tender here, but a little care is all that is needed. Do not press the razor too hard against the face.

Many people will not take the trouble to learn to shave the left side of the face with the left hand, but it is much handier to do so and a little practice and patience will soon overcome the awkwardness you at first experience and show you the many advantages of using the left hand. Draw the skin tight with the right hand held across the nose or with the arm reaching over the head. This same position is retained in shaving the right side of the face and the neck. Some people have great difficulty in shaving under the chin. In this operation I would suggest that you hold the head back and draw the skin tight. To shave the left side of the face under the jaw bone, hold the head back and a

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little to one side, just enough to draw the skin tight. Observe the same instructions in going over the face the second time, except that instead of using lather moisten the face with warm water, or bay rum or witch hazel. When through, wipe the razor dry and strop it two or three times.

Neither is there any use of going to the barber to have your razor honed. It is an extremely simple process, and for your own use you probably can do the work better than a barber. Selecting a good hone is of primary importance. You can tell whether it is good or bad by looking at it. The hone should be clean and should have no flaws or hard spots in it. See that the grain is neither too coarse, nor too fine. If too coarse it will give to the razor blade a coarse-cutting edge; while if too fine it will be a slow process to hone the razor. So in shaving as in other things avoid extremes. Do not let any oil get on your hone. Use lather made from soap and water, the same lather as you put on your face.

After lathering the hone, lay the razor flat on it, and draw the edge toward you. You may press on the razor during the first four or five strokes, but do not press too hard. After that glide the razor over the hone with its own weight. As you think the razor is getting sharper, draw it slower and slower. Let the last few strokes be extremely gentle, merely letting the razor touch the hone. Delicate handling of a razor is the secret of its success. When you have made the last gentle stroke on the hone, wipe the razor dry and strop it. Use only the finishing side of the strop and bear lightly on the blade. Try the razor after stropping it by cutting a hair, and if it cuts it as soon as it touches the hair the razor is ready for use.

The canvas side of the razor strop is rarely ever of use to the person who shaves himself. Sometimes it may be employed in lieu of a hone when you may think the razor is not dull enough to be honed, but the advisability of this even is doubtful.

Caring for your hone, strop, brush and razor is of first importance. The razor should be kept in its case perfectly dry when not in use. The razor strop should be rubbed with shaving lather about once every two weeks to keep it soft and pliable. Lather it well with the lather you use in shaving and rub vigorously with the hand until the strop is dry. This operation may be repeated two or three times in succession. The shaving brush should be thoroughly washed after each shave, wiped dry and placed where it will keep clean and dry until needed again. Some lay the brush crosswise the top of the cup, but a better plan is to hang it up with the brush down by means of a little brass holder attached to the wall, similar to the holders used in keeping rubber stamps. Wipe the hone dry when you have finished using it, and also keep it well covered so that it will not accumulate dust. Wipe it with a soft cloth before using to remove any dust.

You should always have two razors, one for the first operation of shaving and one for going over the face the second time. The latter should always be kept extremely sharp and the beauty of it is that it will remain that way for a great length of time with the necessity of very little stropping. The two razors add much greater pleasure to shaving. It is going over the face the second time that usually causes any soreness, and with the sharp razor ever ready for this light work the face is generally kept in a much better condition. It is easier to keep the two razors sharp than to keep one sharp.

"The hardest knife, ill-used, doth lose his edge."—Shakespeare, Sonnet XCV.

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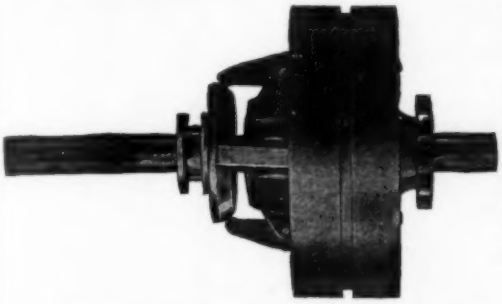

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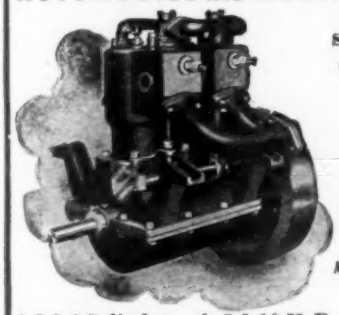

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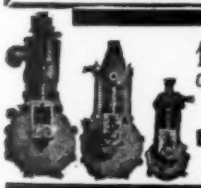

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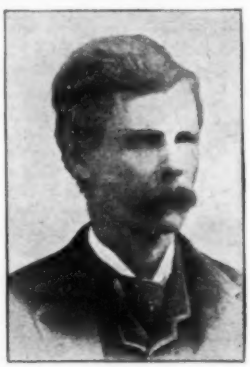
THE STORY OF THE INVENTOR OF THE NAPHTHA LAUNCH.

Frank W. Ofeldt, the inventor of the naphtha launch, was born in Sweden on May 24, 1836. From his youth he was deeply interested in mechanics. At the age of 30 he came to America, the place offering the best advantages for the man who would rise in the world. He had so little knowledge of the English language, however, that he was obliged to accept a position as a laborer in laying out Prospect Park, Brooklyn. His employers discovered he could handle a theodolite and he was advanced. During all this time his knowledge of English was growing.

Later while employed in a machine shop engaged in the manufacture of looms, Mr. Ofeldt invented a machine for the manufacture of illuminating gas generated from gasoline. The invention drew capital and the old Star Gas Machine Works of Newark, N. J., was formed. While still working at and improving this machine in 1882 Mr. Ofeldt discovered the expansive property of naphtha, which he connected with the propulsion of boats, and so devised the naphtha launch. Formerly launches had been little used, because the use of the steam boiler necessitated so much bulk, but with Mr. Ofeldt's invention they became popular the world around. It was patented in 1883 and a stock company called the Gas Engine and Power Company was formed, with the inventor as vice-president. After a year and a half he resigned. In 1888 he invented the Ofeldt naphtha steam system, constructed by a New Jersey firm on rovalty, with Mr. Ofeldt as mechanical engineer. The company failed in a year and Mr. Ofeldt, with his sons, manufactured the engine from 1889 to 1892.



Frank W. Ofeldt

He later invented the Alco-Vapor engine, which he sold to the Marine Vapor Engine Co. in 1895. He then returned to Brooklyn and built the device known as the Compound Vapor Motor, which he declared was the climax of all he had invented, as it was lighter, safer and more reliable than any of the other inventions. His was a great and prolific mind, leaving tangible results to the world. He died in September of the present year at Brooklyn, N. Y.

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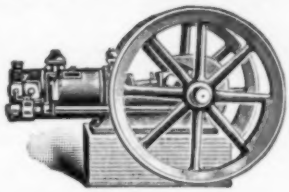

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A FEARFUL FALL.

As we watched an artist, not long ago, skillfully retouching the frescoes in the dome of the capitol at Washington, we recalled a story of another artist whose "retouching" of a dome ceiling came near being his last work. Just starting out to earn his living, he said he was ready to paint anything from a portrait to the sky piece in a theater. He told his story thus:

"One of the public buildings in the capital had a big dome, and on the ceiling of the dome was a great deal of elaborate painting that had become dingy, and needed retouching. I was pleased enough when I got the job of doing it.

"They erected a staging for me to work on—a frail-looking affair, which almost turned me sick when I arrived with my outfit and stood in the rotunda, looking up at the dome, a hundred and fifty feet above me.

"'I shall be so dizzy I can't hold a brush,' said I to the carpenter.

"'Oh, that will be all right!' said he. 'We're going to spread a big canvas under the staging, for the rotunda is in use all the time, and you'd be spotting everybody below with paint unless we had something to protect them.'

"I felt relieved when I heard that, and still more relieved when I had climbed up into the dome and found that the entire rotunda below was hidden by a taut cloth which the workmen had stretched across.

"I had been at work nearly two days when I began to get careless in stepping round the staging. I suppose the canvas below me gave me a feeling of comparative safety. About noon one day I took a step backward to look up at some drapery which I had just repainted. My foot touched only the air, and I fell into the canvas.

"There was a ripping and tearing of cloth as I settled down into the hollow. I lay there flat on my back, and looked round with an interest in the quality and strength of the canvas and the way in which it was fastened that you may be sure was sincere.

"There was no doubt about the strength of the fastenings; they were of rope, tied round big knots in the cloth, and strong enough to hold a horse. But the canvas itself was frightfully thin, and was mildewed in spots. I turned over on my face and found myself staring through a rip down to the marble flooring of the rotunda, a hundred feet below.

"I was comfortable enough physically, but mentally! Every time I moved something would stretch and tear.

"Of course I yelled for help, and after a time I heard answering shouts down below. The canvas was sagging down in the middle and straining and squeaking along the edges. I figured out that it would take the workmen at least two minutes to

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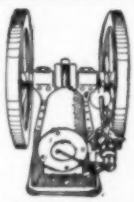

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climb into the dome. By the time they got to me I thought I should be spread out below.

"I tried to move up the incline of cloth, scrambling along on my stomach and pushing with my feet; but the attempt widened the rip in the canvas. Suddenly, as I pushed harder with my feet, one foot and nearly the whole leg shot through the canvas.

"I could hear the scream of women below. My finger-nails scratched and clawed the rough surface, but of course made little impression. They simply kept me from slipping quite so fast. Then I heard the steps of men on the scaffolding. They let down a rope that curled near my fingers, but it was several seconds before I dared to let go my hold on the canvas for a sufficient time to grasp it.

"Finally I got both hands on it, and they dragged me up the incline to the staging."

REGULATING GASOLINE ENGINE.

The object in mixing air with gasoline vapor is to obtain enough oxygen to cause complete combustion to take place. All oils may be ignited and burned at the proper temperature, if a sufficiently high temperature is produced so that air can circulate and mix with vapor, says the Automobile Review. At certain temperatures such oils give off inflammable vapors, and at a higher point may be ignited themselves. The first temperature is called the flash point, the second the fire point. If the air supply is cut off, neither the vapor nor the liquid can be ignited. Again, if too much air is present, the mixture cannot be exploded.

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A Pennsylvania man bit into a peach the other day and was stung by a bee which was having a good time in the interior of the fruit. If people will butt into the business of others, they must not complain of the consequences.

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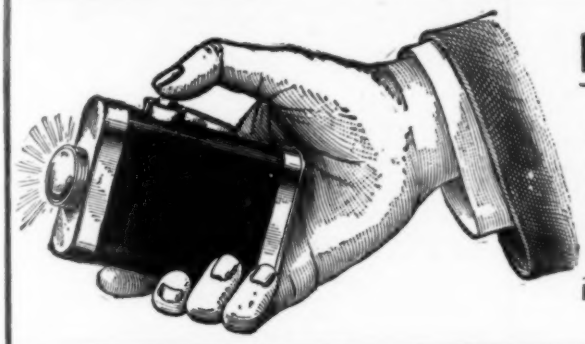

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Said the lawyer, jocularly but ungraciously, "Doctor, these are members of your flock. May I ask, do you look upon them as white sheep or black sheep?"

"I don't know," replied the reverend doctor, drily, "whether they are black or white sheep, but I do know that if they are long here they are pretty sure of being fleeced."

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It is said to be a positive fact that the Chinese made a paper from a fibrous bark 1,800 years since and, as the civilization of the Celestial empire at a remote date was of a superior character, it is probable that we owe our present paper of commerce to that mysterious people.

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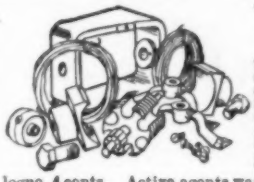

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MAIL SHIPS RACE AT SEA.

Stirring Times Driving a Mail Ship Below and on Deck.

Ocean racing to the average marine engineer will never lose any of its charm. It doesn't matter if he is in charge of the crankiest old bag o' tricks of a debilitated tramp or the intricate twin-screw engines of the liner of the present day, he cannot resist the temptation to try her powers against any rival that they may come across on the high seas of the world. It is astonishing to see the way two old tramp ships will plunge along, day after day, at their allowed speed limit of about 8 knots with no particular aim, perhaps, but to be the leader in an ocean race. But ocean racing is seen at its best on the fast mail ships, when getting the mail off, or the pilot, by quarantine, is the goal they are driving for. With about half a hundred men on watch in the engine and boiler rooms, all more or less imbued with the racing spirit, the mail ship can soon be raised from her usual speed to her speed limit, and held so for days, weather permitting of course.

As we have known for days that our rival was running abeam, about 15 miles to northward of us, we are not surprised when she appears over the horizon at noon heading like ourselves for New York. If outward appearance goes for anything, she betrays every symptom of a desire to get there ahead of us as she drives along with smoke rolling from her funnels and foam breaking from her bows. We accept the silent challenge and await with impatience the word to "let 'er go" which presently comes down the ladder. Soon the word passes through the boiler rooms, and with the increasing energy of the firemen the steam creeps up. The men gradually knock off jawing one another, as all their spare time is occupied in having a blow under the ventilator. The only sounds heard are an occasional sharp command, the clash of the furnace doors, or the rattle of the firing tools. The temperature of the boiler room rises, sometimes to about 130 degrees Fahr., and it is surprising to see how well the men hold out in this intense heat.

Presently the engineer steps into the bunkers, and running his eye over the coal points out the best coal for steaming purposes with the curt order, "Rush it out!" The coal-passers usually work in pairs, a novice being selected to work with an old-timer, if possible. Divested of all but their pants and shoes, skin black as ebony, and dripping with perspiration, they shovel and wheel. They also have succumbed to the prevailing excitement, and woe betide the luckless individual in the way of the loaded iron barrows as they emerge at a run from the bunkers and, dexterously shooting the coal out in front of the furnaces, are off again for another load.

In the engine rooms, where the monstrous four-crank engines are tearing round, the engineer in charge is even more on the alert than usual, as it would not do to have anything happen in a crisis like this. His eyes seldom leave the rows of gauges as he notes the various pressures recorded, his condenser vacuums and temperatures of his sea injection discharge, feed water, etc. Close to the levers is a telegraph to the bridge, a telegraph to the boiler rooms (humorously pointing to "more steam") and a telephone to the wheel house. From his position at the levers he sees but little of the machinery beyond the flying cranks, but his assistants and oilers making their reports keep him posted as to how things are running. Every half hour, perhaps oftener, he will take a note of the figures on the revolution counter and calculate the average revolutions since coming on watch. He notes with satisfaction each decimal point of a revolution gained.

and sends word to his colleague in the boiler rooms. He also sends a few caustic remarks if the revolutions are not increasing as time passes. He knows and understands the various sounds around him, as each piece of machinery has its own clank or beat, and any change from the usual would at once make itself apparent to his quick ear.

Over the auxiliary machinery the junior engineers keep the watchful eyes of a fond parent, as each individual pump is like the link in a chain, and a slight hitch can set the whole system wrong. The junior knows from bitter experience what a little two-hours' sweat on a broken-down feed pump means and, as he goes around, passes his hand over the various nuts and pins on the pump gear.

The latter two hours of the watch see us steaming our best, as we had about twenty fires to clean with their ash-pans and smoke-boxes after we came on watch.

"Eight bells" rings at last and we are by no means sorry to be relieved, as four hours is quite enough for any man.—American Machinist.

SOLID RUBBER TIRES FOR AUTOS.

Mr. J. M. Maclulich, an authority on rubber tires, in a paper read before the Institute of British Tire Manufacturers last week, made the assertion that properly constructed solid rubber tires in conjunction with good springs, such as are now fitted on all first-class motor cars, practically absorb as much vibration as pneumatic tires.

To this statement he adds that the advantages economically are much in favor of the solid class and that they possess the additional advantage of raising much less dust. A solid tire is also less liable to side slipping.

Before it is possible to use solid tires on a car that has been built to use pneumatic ones, it is necessary to make certain changes in the springs and spring hangers. Without these changes the driving of the car will be accompanied with unpleasant shaking that will prove disastrous to operator and car.

The Automobile says: In the manufacture of solid rubber tires the best ones are made out of pure Para rubber, in the washing and preparation of which fully 15 per cent is wasted. The tire must not be made out of pure rubber entirely, for if so it would be too soft to support the weight of the car and would be continually springing out of the rim channel. These tires are a composition, the major portion of which is pure rubber. At present there is not sufficient discrimination between good and bad solid tires. In the many cases the buyer being entirely ignorant of the differences that can exist in these tires, imagines that all solid ones are alike and so purchases with his eyes shut.

OF COURSE IT'S SO.

An old fellow from one of Portland's most remote suburbs, while passing a certain hardware store in that city the other day, noticed a sign which read, "Cast Iron Sinks." The old fellow chuckled softly to himself; then, gradually, as the absurdity of it dawned upon him more forcibly, he broke into a loud guffaw. A passer-by, attracted by the apparently unseemly mirth of the old man, made bold to ask what amused him so. "Why, gol durn it," he sputtered between spasms, "ef some folkses air not gettin' to be reg'lar durn fules. The idee uv hangin' up er sign tellin' people that 'cast iron sinks.' "—Lewistown Journal.

An enterprising undertaker, according to the Greenville (O.) Tribune, has invented an auto-hearse, and his daughter says "folks are just dying to ride in it."

The American Well Wks.

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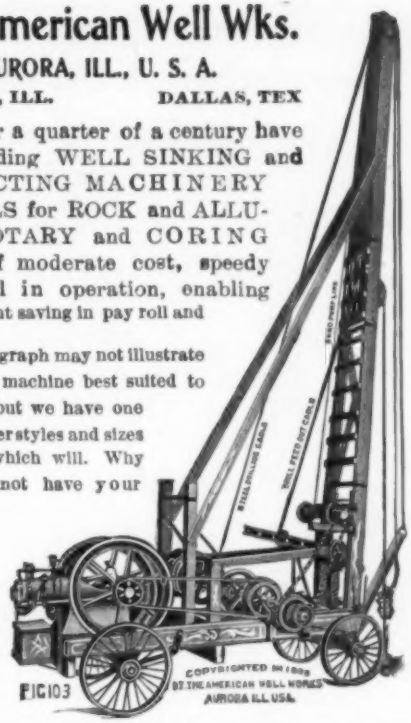

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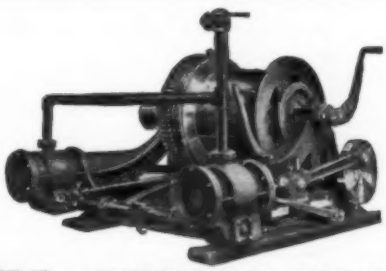

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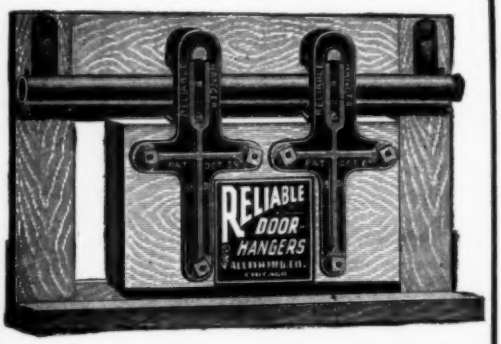

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ERRORS OF SCIENCE.

By J. G. Walt.

If science is the truth demonstrated, or known facts classified—there are no errors in science—and the errors are nothing more than the wrong opinions of some man or men who are termed scientists, because of their researches and study after truth.

A few days ago a scientist from Austria was reported to have weighed the sun's corona at Lick's observatory. Every newspaper had the report and the number of tons that this outer envelop of the sun weighed was given.

Now it is possible that the man is mistaken and that he measured the force of the electric vibrations sent out from this electric sphere—and not a volume of matter contained in the sun's corona.

For many years we have read of the great variations in the sun's corona, and that the flashes of light sometimes extend for hundreds of thousands of miles into space, while at other times not so far—that is, there is a variation.

Pictures of the corona represent it as something like the streaks or rays of light we see around our arc lights on the streets.

What are these rays but visible electric vibrations?

And as it is well known that we would not be able to see but for etheric vibrations (for light is a vibratory motion of the atmosphere set agoing by the sun's rays)—so is it not fair to conclude that the sun's corona is nothing more than gigantic electric waves—and not something that can be weighed like molten iron or other matter?

It is a scientific truth because it has been demonstrated that no atom of matter can be destroyed; hence, the theory held by many scientists, that the sun is a sphere of matter slowly burning itself up, is untenable. No atom of matter can be destroyed, else the universe would become unbalanced; so whatever the sun is, it is not going to be blotted out in time.

The sun—that glorious orb of day—is the cause of life, light, heat, and electricity upon our planet, and is, in the opinion of the writer, an electrical sphere absorbing from the universe as much energy as it gives. This is not a scientific truth—as yet only an opinion—but, if it accords with the truth, then it will become a scientific fact some time.

Science tells us that the earth's axis is inclined something like 23 degrees to the sun's axis, and that this is what causes our changes of seasons.

This is true; but nowhere have we seen an explanation of the reason why it is so inclined.

The reason is, because that part of the earth on what we call the north side of the equator, is loaded with a greater amount of land than the south side. The part of the earth south of the equator contains more water, which is lighter than the earthy matter to the north, and this is what causes the inclination—in our opinion. If the land was evenly divided, the axis would, no doubt, be parallel with that of the sun, and our seasons would be unchangeable, only one season like that at the equator. Now if a child should happen to ask why that land happened to be as it is we would be obliged to say because; or silence it by saying, it was decreed so by the Creator.

Pliable marble is a curiosity little known to the public. In the possession of Prince Borghese some time ago were six slabs of marble which could be bent at will. The peculiarity is believed to be due to the effect of fire. When placed on end they bend backward or forward; laid horizontally and raised at one end they curve; placed like a see-saw on a block of other material the ends droop. They are excavated at Mondragon, near Naples, and have a grain like Carrara marble.

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CLEANING MILK VESSELS.

Milk should always be rinsed out of vessels before they are scalded. If this is not done, the albumen of the milk will be coagulated by the heat and adhere to the sides, making its removal difficult. It is important, therefore, not to have the first wash water too hot, says Hoard's Dairyman. Cold water is sometimes recommended, but this is not necessary, as it may be quite warm without changing the condition of the albumen. The best practice is to rinse the vessels with cold or warm water, then wash in hot water by the aid of some cleaning preparation, then rinse carefully and enough to remove all soap, salsoda or other cleaning material, and finally sterilize in a steam chest, exposing them to live steam about three minutes. The methods generally used in washing milk vessels are very imperfect. The vessels are often carelessly rinsed with cold water, then one is filled with hot water and cleaned with a cloth, the same water being made to serve for other vessels successively, being turned from one to another, and by the time the last is reached, the water is no longer hot and is decidedly milky. When water is not hot, the grease is not removed, but simply smeared over the tin. Two wash-sinks should be close together, one for the general cleaning and the other containing clean, hot water in which each article is rinsed as soon as it is washed. Most utensils easily dry after being steamed, but if they do not they may be put in a drying room or wiped with a clean cloth. They should be placed in pure air, and in sunshine if convenient. though this is not necessary, if well cleaned and thoroughly sterilized.

HORRORS OF BERI-BERI.

Beri-beri, the disease peculiar to India, formerly known as "the bad sickness of Ceylon," as so many cases of it existed there, is said to be the most terrible disease known to mankind. It even exceeds in horror the Bubonic Plague, because death is more tardy in coming to the sufferer's relief, says the Western Undertaker. It is characterized by great weakness, numbness and inability to make proper use of the limbs. The entire body becomes a nervous, shaking, trembling wreck, involuntarily assuming all sorts of postures, both grotesque and horrible; groveling attitudes like those of beasts and reptiles. The expression of the countenance is beyond the patient's control, and the most hideous grimances, as in St. Vitus' dance, only worse, distort the features. To witness them is painful in the extreme, and it affects the beholder to such an extent that but few are brave enough to stand by the afflicted in the effort to give relief. Whenever this disease breaks out in an Indian town, the natives become utterly demoralized, so great is their terror. The treatment usually given is brisk rubbing and stimulation, but there is, in but few cases, scarcely a particle of hope for the victim's recovery, from the first moment of attack. Some British physicians are giving the malady special study and attention, in the hope of discovering a remedy

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Since a Canadian company installed a plant for the manufacture of wire-wound wooden pipe there has arisen a great demand for it, as it is claimed to be much superior to iron pipe for water supply purposes and can be furnished at less than half the price. It is not so heavy to handle and is less liable to burst upon freezing than iron pipe. Mill owners and mining engineers are using it instead of flumes with a resultant saving in water and repair. L. Edwin Dudley, U. S. Consul at Vancouver, B. C., reports that 30 or 40 carloads of the pipe have been shipped to various Canadian territories.

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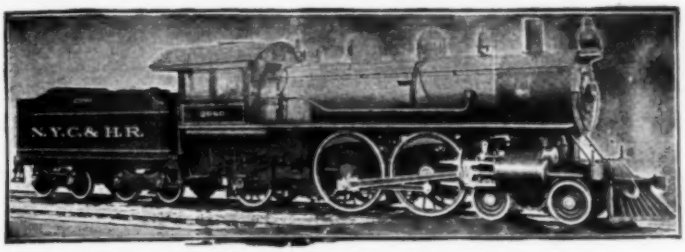

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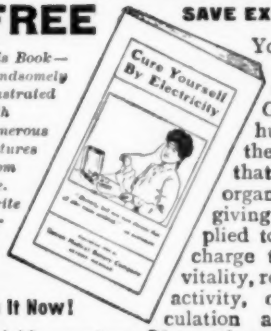

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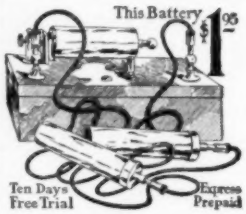

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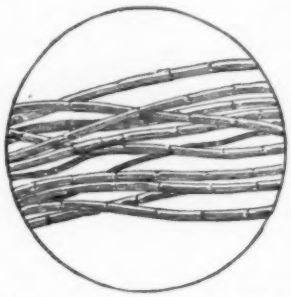

Fig. 1. Microscopic Reproduction of Flax Fibre

periments have shown that just as fine can be raised in this country as anywhere.

Not one spool of linen thread for manufacturing purposes has even been produced in the United States; not one piece of goods in a thousand sold as pure linen has a thread of linen in it, not even the merchant, who does not use the microscope, can tell cotton goods from linen goods. The supply of linen is running shorter every year and the only

Fig. 2. Microscopic Reproduction of Cotton Fibre

way to satisfy that class of people who demand pure linen at any cost is to make a superior imitation out of cotton.

An expert says: Under the microscope we find that the linen thread is composed of a large number of fibers, each about two inches long. Each fibre is a straight hollow tube more round than flat. This tube is divided into joints very much like a stick of bamboo. The cotton thread is divided into a much smaller number of fibers, which look like twisted ribbons and have no joints. They are hollow like the linen, but are of much less strength, the proportion being about twelve to seven, and when woven into cloth about three to two.

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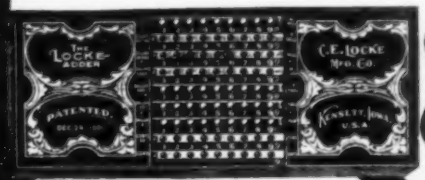

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The descriptive article on page 1011 of the October issue of Popular Mechanics, in which no name or address was given, had reference to the

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Since the United States patent laws were enacted 1,447 inventions have been patented by 344 New Britianers. The offices of the New Britain patent lawyer are an interesting spectacle almost any day of the week. Here one finds many geniuses, queer and otherwise. Justin A. Trout, with a record of 121 patents, is one of the most successful of New Britain inventors. He has made a fortune out of seeming trifles. George E. Adams has 66 patents. It is almost impossible for a man or woman to dress without using some of his inventions. Suspender buckles, hose supporters, garter fasteners, corset steels, hooks and eyes, glove clasps, shirt studs, collar buttons and such things he has invented galore. Fifty-one devices have been patented by Thomas E. Corscaden. Among them in all probability are the handles of the coffin in which you will be buried, and similar grewsome, though necessary devices. Henry G. Voight has patented 44 contrivances for the protection of life and property. He is a man of padlocks and door knobs and latch keys and window fasteners. "Chris." Downey, of Waterbury, has invented 28 different things, his latest being a "football squawker and whisky bibaculator." It is a kind of whistle which holds whisky. At a football game the owner of the device may take a drink of whisky and his companion may think he is only blowing his squawker. It is strange that in the list of New Britain patentees there are but few women. Sarah Jane Wheeler patented a curry-comb; Elizabeth Minier is the inventor of a fruit jar cover fastener; Alice M. Hobson owns a patent for a steam cooker and Frances E. Maisonbille devised a meat tenderer that brought her considerable revenue.

JAPANESE WAR POSTALS.

An Ingenious Idea of the Mikado's Government.

The Japanese Government has found a novel and excellent use for post-cards. Realizing that, for various reasons, the soldier on campaign may not have leisure or opportunity to write home to his family, the military authorities have supplied to each army a sufficient number of post-cards, ready printed, to which the soldier has only to affix his name, or, more exactly, his seal, each Japanese soldier carrying one with him as part of his outfit. On all the cards the same message is printed: "This is to let you know that I am alive and well. I cannot give you my address, not knowing where I shall be tomorrow; but your letters will reach me sometime or other if you reply to the place, the name of which is printed in the postmark. Greetings to my family and friends." This is an idea which might well be copied by other nations, says a writer in the Manchester Guardian. At once practical and humane, it would cost little and save many thousands of people from unnecessary anxiety and pain.

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